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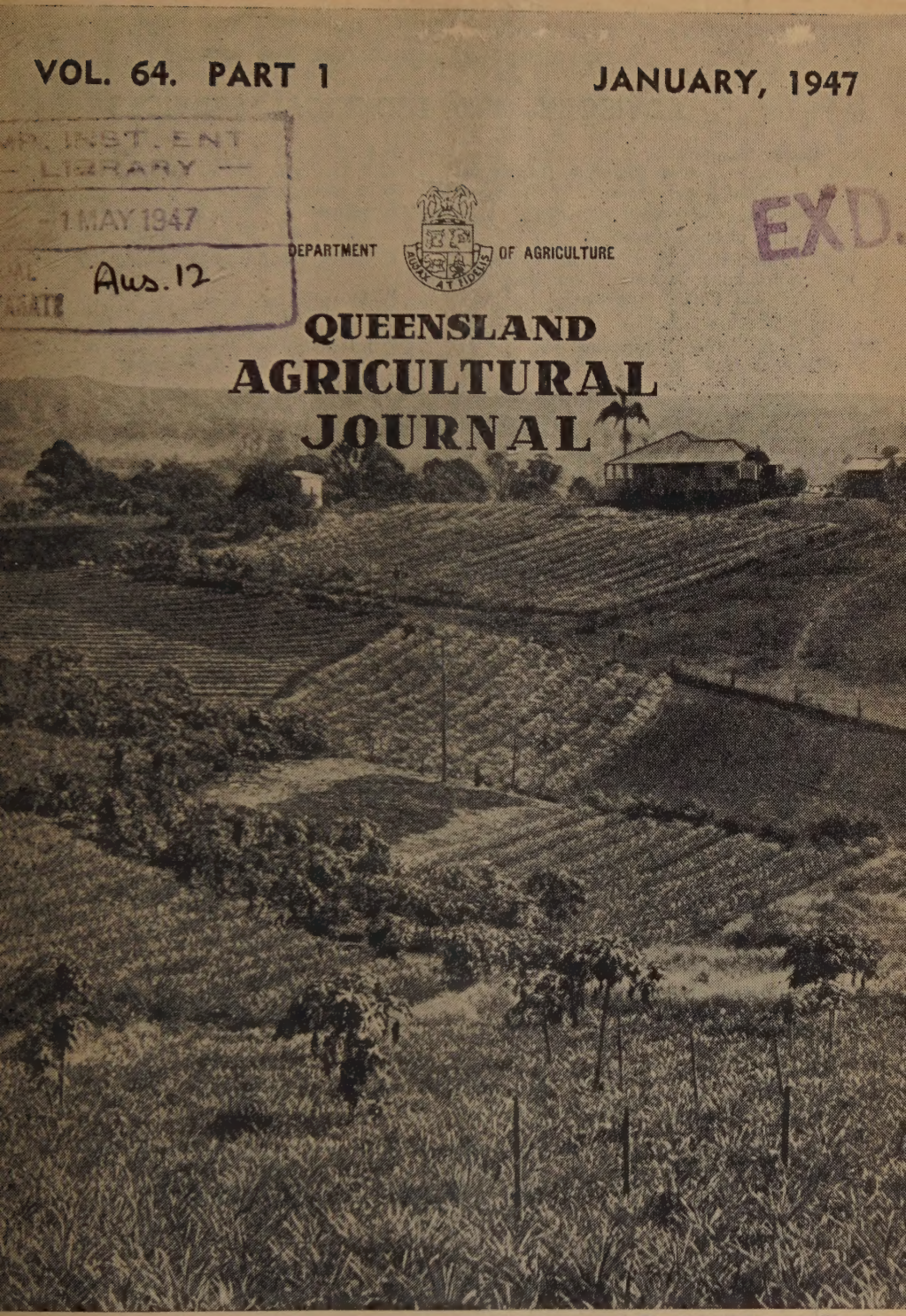

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LEADING FEATURES

Notes on Kudzu
Avocado Varieties
Plants Poisonous to Sheep
Scabby Mouth of Sheep
The Determination of Milk Solids
Sodium Fluoride Treatment for Pigs
Examination of Diseased Fowls

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Volume 64 Part 1

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
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Associate Editor
C. W. WINDERS, B.Sc.Agr.

JANUARY, 1947

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QUEENSLAND AGRICULTURAL JOURNAL

Volume 64 1 JANUARY, 1947 Part 1

Event and Comment.

Fodder Conservation.

SOIL and climatic conditions in the agricultural districts of the State are generally favourable to the production of many summer fodder crops, yet the quantity stored annually is far below ordinary winter requirements. Winter rainfall is often an uncertain quantity, consequently the planting of seasonable crops for grazing cannot be undertaken with any assurance that they will provide sufficient winter feed. Summer fodder crops, however, can be sown with greater confidence and from them a much greater bulk of green feed can be produced and the surplus stored for dry-time use.

In the early days of dairying in Queensland, particularly on the richly fertile soils of the rain forest regions, the growth of sown pastures was so luxuriant that the need for fodder conservation was not felt, although the rate of stocking was then considerably higher than in later years. The gradual decline in the carrying capacity of even the richest lands through the depletion of soil fertility, impaction caused by heavy stocking, the root-binding of old swards and other causes has since made fodder conservation a necessity on most dairy farms. A similar serious reduction in the carrying capacity of native pastures also has occurred. For these and other cogent reasons, a silo or some other satisfactory system of stock food storage has become an essential factor in profitable dairy farming.

A committee of experienced technical officers of the Department of Agriculture and Stock has been set up to deal with the practical aspects of conservation and through which will be channelled advice and guidance on the various ways and means of providing reserves of stock feed for use in time of need.

THE MINISTER'S NEW YEAR MESSAGE TO THE FARMERS OF QUEENSLAND

DURING the past year agriculture, in common with other industries, was faced with the necessity of making many post-war readjustments. In addition to the difficulties of this transitional period, seasonal adversity was a cause of serious hardship. The obvious lesson of the dry season is bound up with the wisdom of adequate fodder and water conservation. Practical assistance from my Department in respect of ways and means of providing for stock food storage is at the call of farmers throughout the State. The Government is fostering many projects, besides those already completed, for water conservation, which will have a direct bearing on the improvement of conditions in rural industry.

Plate 1.
Hon. H. H. Collins

Far-reaching legislation has been enacted for the economic development of our land and water resources, for it is realized that no country can thrive without a prosperous agriculture—a prosperity based on better farming and better living.

In the year just ended further substantial progress was made in the extension of Queensland's rural policy—a policy embracing the effective peopling of our country districts; sound technical instruction in both new and established industries; the strengthening of advisory services, aiming at improvement in cultural methods and the raising of livestock standards; a wider acceptance and application of the principles of agricultural economics; the promotion of scientific research; and beneficent legislation. Without, however, the active and intelligent co-operation of all concerned but little progress could be made. It is for farmers themselves to study carefully the problems of the field and of the market. Where practicable, it is for them to apply the results of our mutual efforts in community and national service.

We have a great country—one of the finest in the world—in which people may live more happily, healthily, longer, and in many ways better than anywhere else; with faith in ourselves and confidence in Queensland we may look forward to yet another year of progress and achievement.

I wish the farmers of Queensland all good in the coming year; that prosperity will be brought to their homes and happiness to their families; that they will be blessed with a full realization of all their hopes; and that success will continue through a long and fruitful future.

H. H. Collins

Secretary for Agriculture and Stock.

Department of Agriculture and Stock,
Brisbane, 1st January, 1947.

Notes on Kudzu.

T. G. GRAHAM, Q.D.A., Adviser in Agriculture.

KUDZU (*Pueraria Thunbergia*) is a native of Japan, and has figured prominently in the soil conservation programme of the United States of America within recent years. The plant was brought into Queensland many years ago, and although it made excellent growth in parts of Southern Queensland it did not become popular and eventually went almost out of cultivation. In view of reported successes in America, fresh introductions were made and trial plantings were placed out along the coastal belt of this State. Climatic conditions over a large portion of this coastal area resemble those experienced in the south-eastern States of the United States of America.

The legume has not been under farm trial sufficiently long to enable its likely value in Queensland to be determined. On the tropical north coast it is inferior to *Puero, Pueraria phaseoloides*, a closely related plant, but as it has a higher frost tolerance than Puero, it would prove more satisfactory in the sub-tropical districts. This has also proved to be the case in other countries. There has been a steady demand for information concerning Kudzu, and the following notes on its characteristics, culture, and uses, gleaned largely from overseas reports, should serve as a guide to farmers contemplating planting the legume in Queensland.

Habit of Growth.

Kudzu is a deep-rooted perennial legume with large, starchy roots. It is a vigorous vine capable of forming a dense cover of leaves and stems over the surface of the ground. As the leaves fall they form a layer of litter that reduces run-off and, being held firmly in place by a network of stems securely anchored to the ground by roots at frequent intervals, present a perfect barrier to scouring. The plant is deciduous and even under conditions at South Johnstone (minimum screen temperature 40 deg.) is completely bare of leaves for several months during the winter. Extensive root reserves enable the plant to make good spring growth even in dry weather. In the initial stages growth is somewhat slow, but, under suitable conditions during the second year and thereafter, it becomes rampant and the vines may reach a considerable length during a single growing season.

Soil Requirements.

Kudzu is reported to have a wide range of soil adaptation, but it will not grow on low-lying, badly drained land or on soils of a sandy nature, low in available plant food. It prefers soils which are neutral

to acid, and is growing successfully at South Johnstone on soils with a pH as low as 4·5. A feature of the plant in the United States of America is that with proper care it can be established on scoured land from which much of the surface soil has been removed by sheet erosion.

Climatic Range.

This plant has a fairly wide climatic range, and it is probable that it can be grown throughout the Queensland coastal belt and in some of the adjacent drier country. It is not likely to prove satisfactory in areas where frequent extremely heavy frosts are experienced, nor in hot districts with a high rainfall throughout the year.

Methods of Establishment.

Kudzu is propagated mainly by means of rooted stems, but it will grow from crown buds or buds at the nodes of the stems, and also from seed. Seed setting is usually light. In any case, little success has been obtained in raising plants from seed, as the seedlings appear to be weak and are subject to damping off, while the growth is extremely slow. Further, more careful hand cultivation is necessary in the case of seedlings than is practicable under field conditions.

A piece of stem carrying from two to three nodes, one at least of which has commenced to develop roots, provides a ready means of establishing the plant. Young crowns dug from fields of established stands are probably the safest means of establishment, but these are more difficult to obtain than cuttings. Five hundred such crowns are sufficient to plant one acre. In all cases of establishment best results are obtained when the buds are dormant. Green softwood is of no value for planting material.

The sets are established by placing them in holes made by a mattock and firming the ground around them by means of the foot. Where large areas are intended for planting furrows should be opened up at convenient distances for cultivating, usually between 10 and 12 feet, and the cuttings dropped in the furrow at intervals of from 6 to 12 feet, making sure that one bud is left above the surface of the ground. The furrow is then closed, and the land smoothed out by means of discs or harrows. It is important that the ground is moist at the time of planting, and, if sufficient soil moisture is not present, water should be applied in the hole just prior to planting. Under large scale conditions, planting should not be attempted unless sufficient moisture is present to enable the young roots to strike quickly.

Soil Preparation and after Treatment.

A good root system is essential to enable the plant to stand up to drought, and in order to encourage this considerable attention should be given to the preparation of the field. A deep ploughing is the first step in this direction. This should be done sufficiently in advance of planting to enable the soil to mellow down into a fine tilth.

After planting, the land between rows should be kept loose and free from weeds to enable the runners to root readily and obtain a firm hold. If weeds are allowed to become troublesome, layering of the vines is interfered with. Heavy layering is essential from a grazing standpoint, since it is from the layers that the density of the surface growth

springs. Where weeds have become troublesome, the entire area can be disced provided a good stand has been established. The discs should be set just sufficiently to remove most of the weeds yet with insufficient cut to destroy the rooted vines.

Kudzu Hay.

Kudzu makes hay of an excellent quality and with a feeding value reputed to equal that of lucerne. A perennial with a capacity for storing large quantities of food in its roots, it has an advantage over annual hay crops in that it is less dependent on seasonal conditions. It is usual to expect one good cutting each year, yielding about 2 tons of cured hay per acre. The vines should be cut during the summer when the growth has reached a height of about 2 feet. Difficulty is sometimes encountered in mowing, and it is best to raise the blade so as not to damage the prostrate stems and to use a tropical legume attachment—a device for making a clean cut along the edge of the swath.

Since it makes rank growth, forks are sometimes used instead of rakes, but the vines can be raked quite satisfactorily by means of the ordinary dump rake. Under good curing conditions, the hay can be cured in 3 days if mowing is delayed in the morning until the leaves are free from surface moisture. It is advisable to leave in the swath for a few hours and then put into windrows. If turned next morning after the dew is off the hay can usually be carted in the following afternoon.

Grazing Kudzu.

Kudzu would be of great value to Queensland farmers and graziers if it could be successfully established on waste portions of the farm unsuitable for any other crop, as it is on many American farms, where it provides valuable feed when other crops have begun to dry off.

It is extremely palatable and stock take to it so readily that care has to be exercised to see that the area is not over-grazed. Continuous grazing can destroy a stand, particularly if stock are allowed to graze it closely. On no account should grazing be commenced before a solid stand, at least two years old, has been established. Grazing of Kudzu just prior to milking may cause a slight taint.

No local evidence is available as to the use of this plant for livestock other than horses and cattle, but in the United States of America pigs have been successfully raised on Kudzu pastures, and it appears likely that it may prove a useful source of protein for poultry.

Erosion Control.

Kudzu first came into prominence as a soil conservation crop and has been used extensively for the control of erosion in various parts of the world, principally the United States of America. It has been used with great effect in the healing of badly scoured gullies, on steep slopes to hold soil from washing, and in the re-establishment of lands where the surface soil has been washed away. It has also been found useful for the protection of banks of streams and for holding loose soil on built-up highways.

Eradication.

Kudzu is not regarded as being a likely pest plant. It has been shown to be easily eradicated by ploughing and cultivating and also by close continuous grazing.

Avocado Varieties.

H. M. GROSZMANN, Assistant Horticulturist.

IT is only during recent years that the avocado has become of any commercial importance in Queensland, and the industry is still quite small. Consequently, both in production and in marketing there is much to be learnt. At present, a critical factor is the choice of varieties for commercial growing, and it is fortunate that the industry is still small enough to be set on the right path without undue loss.

It is not intended here to give any final recommendations on the choice of varieties, but only to draw attention to this very important aspect of the industry, to point out some errors, and to outline some general principles of improvement. While the principles will continue to hold good, it is expected that recommendations will change from time to time as new varieties are tested for local adaptation and general suitability for commercial requirements.

Inferior Seedlings Hamper the Industry.

At present at least half the trees grown commercially are seedlings, and on the whole their effect on the industry is bad. The few seedlings which are good regular bearers usually produce fruit which is definitely inferior to that of the better American varieties now available.

The growing of numerous seedlings varying widely in fruit type greatly complicates both production and marketing. It is almost impossible for the grower to master the cultural and marketing requirements of so many seedling types; and the marketing of such a range of varieties, many of them inferior, confuses and often disappoints the consumer. In short, standardisation of varieties is the industry's greatest need. The number of varieties must be reduced to a minimum, and they must be the best available.

The first essential is for the grower with mature seedling trees to recognise those which are definitely inferior. Trees may be inferior for two main reasons:—Either they are shy bearers or they bear poor fruit. Once these trees are recognised they can be grafted over to the best proven varieties, when they will generally be cropping again in two or three years' time. While the operation of grafting requires considerable care, it can be carried out by any capable grower, and advice can be obtained from the Department of Agriculture and Stock. By attending to this, growers will raise the industry to the level of the best varieties now known.

Continued Search for Better Types.

Even this is not enough, however, for no existing variety completely meets all commercial requirements, and none is ideally suited to production in every locality. Consequently, there is a need to develop better varieties and varieties better adapted to diverse localities. Such

Fig. 1. Fig. 2.

Plate 2.
FRUIT OF FUERTE AVOCADO.

improvement may be achieved by testing new varieties from overseas, by combing present seedling orchards for promising trees, and by continuing to raise seedlings from the best varieties.

In regard to the importation of trees or budwood of new varieties from overseas, a warning must be given against the possible introduction

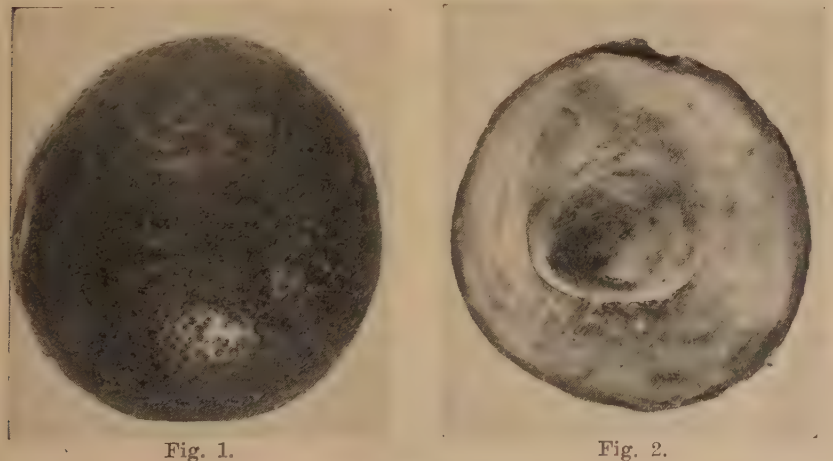


Fig. 1. Fig. 2.

Plate 3.
FRUIT OF NABAL AVOCADO.

of serious diseases such as sun blotch. Any grower noticing any unusual disease symptom in imported trees, or for that matter in any trees, would be well advised to inform this Department.

It is quite likely that in bearing seedling orchards there may be trees of desirable type especially adapted to the locality and bearing fruit of good quality. Growers who have such trees might inform the Department, when the trees could be placed on register and their value assessed. Here it must be noted that even rough annual records of cropping of individual trees are of great value in indicating the yield of a tree and its reliability as a cropper.

While it is obviously not economic for a grower to raise large areas of seedlings and grow them to maturity in search of better varieties, it would be of considerable help if many growers planted a few seeds either selected by themselves from the best varieties or supplied by the Department.

Selecting a Variety.

Avocadoes vary widely and in many ways, and it is necessary to know what are the main points to be considered in selecting a variety. They are summarised here as follows:—

(*a*) Marketability;
(*b*) Yield;
(*c*) Cold hardiness;
(*d*) Vigour;
(*e*) Freedom from disease;
(*f*) Season of maturity;
(*g*) Pollination.

Marketability.

Under marketability come such factors as flavour and texture, fruit size, and percentage of flesh. On the American market it is considered that about 12 oz. is the ideal size. In regard to flavour, it is significant that the rich, nutty flavour of the Fuerte is most popular.

The seed should be small and tight in the cavity, and the skin should not be too thick, as this makes it difficult to determine when the fruit is ready to eat. The flesh should be free of fibre, and should not discolour too rapidly upon cutting. Finally, the fruit should be uniform and of attractive appearance.

In assessing the value of a fruit, it is important not to lay too much stress on any one characteristic, particularly when that characteristic has little or no bearing on quality; and here the consuming public needs to be educated, too. Unfortunately, consumers, ignorant of the true facts, have associated quality with quite unrelated features. For example, the market, recognising the excellent eating quality of the Fuerte variety, has concluded that all fruit that are green and pear-shaped like the Fuerte must be just as good to eat, while all that are not pear-shaped and green must be inferior. Thus the Nabal, an excellent fruit, is rejected because it is round, while some worthless pear-shaped seedling brings top price; and the Benik, a fine fruit, is dumped because it is purple. The obvious remedy is to market good varieties under their varietal names, along with a little instructive publicity, so that the consumer will come to know the varieties and give up associating quality with quite irrelevant characteristics. With this end in view a list of approved varieties could be established, along with appropriate quality and maturity standards, so that the varietal name

would be a guarantee of quality. It is not suggested that seedlings be excluded from the market, but that they should not be marketed under any varietal name until they have been placed on a Departmental register with a detailed description so that only one type could be marketed under the one name. In this way any promising seedling could undergo the test of the market. In the course of analysis and description of the fruit it would be possible to advise growers whether the variety was worth propagating.

Yield.

From the growers' point of view high yield is obviously desirable and regular cropping a great asset. Even the excellent Fuerte variety falls short of this ideal in its main areas of production, as it tends to bear heavy and light crops alternately. It is important to keep yield records of the different varieties.

Constitution and Habit of Growth.

As avocadoes are susceptible to injury by frosts where low temperatures are at all likely, resistance to cold is desirable. Here it may be remarked that there are three main races of avocadoes—the Mexican, the Guatemalan, and the West Indian, given in order of their resistance to cold, the West Indian being the least tolerant. The main varieties on the market are either Guatemalan or Guatemalan-Mexican hybrids. It has been observed that even within the one race there is quite marked variation in cold hardiness.

The tree should be sufficiently vigorous to bear a large crop and to do this without any marked setback in growth. Freedom from disease must not be neglected, as it saves expensive control measures and losses inevitably incurred with disease susceptible varieties. Habit of growth is important, too. A low, compact habit of growth is preferable to a very tall or straggling habit, as it facilitates cultural operations. It is also an advantage to have a tree that is not easily damaged by wind.

Season of Maturity.

If the avocado is to become a regular article of diet and not merely a luxury it will be an advantage if varieties can be found which will extend the supply of high-grade fruit throughout the whole year.

Pollination.

A rather unusual feature of avocadoes is that, quite independent of race, they consist of two distinct groups of varieties based on flower mechanisms which differ in such a way that a flower from one group is generally pollinated in nature only by pollen from a flower of the other group. The two groups are called A and B, and generally to obtain a good set of fruit it is necessary to have trees of both groups present in an orchard in close proximity to one another, and either having their peak flowering at the same time, or at least with their flowering periods overlapping.

The above question of pollination is still rather obscure, and there are notable exceptions in the behaviour of certain varieties overseas under special climatic conditions. Still, in the absence of sufficient information on the behaviour of varieties in Queensland it is best to be on the safe side and include varieties from both groups in any one planting.

Varieties Recommended.

In a general way, the above outline has shown that the industry in Queensland is hampered by the presence of too many inferior seedling trees; the immediate steps that should be taken to remedy this have been indicated, and also the main objectives that must be kept in mind in improving the stock and standardising the industry. Some concrete recommendations can now be given. These are based on observations made on several varieties in Departmental plots in the Maroochy Shire. The varieties in question were originally selected on their place in the Californian industry, and on their performance at Tamborine Mountain. There are some more recently introduced American varieties from both California and Florida, and also some promising local seedlings which are worth watching, but they cannot be included here as they have not yet been carefully studied.

It is believed that the two best varieties available are the Fuerte and the Nabal, and that these should constitute the bulk of plantings in the near future. Most inferior seedlings should be worked over to them.

The Fuerte has a green, pear-shaped fruit averaging about 12 oz. in weight. The flavour is excellent, the seed small, and the skin is fairly thin. The fruit matures approximately from the middle of April to the middle of August. The tree is low-growing, large, and fairly frost resistant. There is some indication that it fruits better on the basaltic plateaus than on the lower coastal areas.

The Nabal bears a large, round, green fruit, also of excellent quality. The seed is small and the skin thick. The fruit is rather larger than is considered ideal for the market, but its eating quality compensates for this. The tree is large and of good shape, though sometimes a little tall growing. It is not as frost resistant as the Fuerte. Heavy crops have been observed on both the lowlands and the red soil plateaus. The season of maturity is roughly during October and November.

These two varieties leave fruit in low supply in August and September, and also in December, January, February, and March. Furthermore, as they are both of Group B, pollinators from Group A are required.

Two A group varieties, Anaheim and Benik, will bridge the August-September gap, as both mature their fruit at this time. However, while they will help, they are not ideal pollinators as both are mid-season blossomers, while the Fuerte is very early and the Nabal very late. The Anaheim is very prolific and a regular cropper, but its fruit is not quite as good as that of the Benik. The fruit of the Benik is purple when mature. Both varieties are susceptible to frost injury.

So far as is known, suitable varieties maturing their fruit from December to March are not available, but it is possible that some of the late Guatemalan and early West Indian varieties may be found to fill this need.

The Department intends to continue the study of avocado varieties, and it is hoped that more information will be available before very long. However, as a variety must be observed for several seasons before its value can be assessed, it will take time to gather reliable information. In this matter the growers can assist greatly by keeping even the simplest records.

APPLIED BOTANY

Plants Poisonous to Sheep.

S. L. EVERIST, Assistant Botanist.

Introduction.

THIS article makes no attempt to describe all the plants in Queensland which are poisonous to sheep, but it does include those most commonly regarded as responsible for plant poisoning in the sheep-raising districts.

Each plant is treated under the following headings:—Common names, botanical name, description, distribution, seasonal occurrence, evidence of poisoning, symptoms, post mortem, prevention and treatment.

Much of the veterinary information has been provided by officers of the Division of Animal Industry.

General Notes on Plant Poisoning.

When investigating cases of suspected plant poisoning, several things must be considered. The most important points to note are:—

1. The kinds of plants eaten by the animals.
2. The condition of the plants.
3. The stage of growth of the plants.
4. The physical condition of the animals.
5. The routine being followed by the animals (grazing, travelling, etc.).
6. The previous history of the animals.
7. Seasonal conditions.
8. Weather conditions at the time and for several days beforehand.

1. *Kinds of plants.*—Some plants are known to be poisonous to stock, others are suspected but without definite proof, and others are known to be harmless. The first step is to find out what the animals have been eating. This may be done in two ways: (*a*) by detailed study of the paunch contents; (*b*) by careful examination of areas where the animals have been grazing.

Identification of paunch contents is usually difficult and sometimes misleading. By careful study, a botanist can identify most of the plants in the paunch of a freshly killed sheep, but if decomposition occurs identification is often quite impossible. It is important that paunch contents be fresh when examined.

Examination of paddocks or stock routes grazed by affected animals often reveals the cause of the trouble. Notes should be made carefully of the extent to which various plants have been trimmed. Such notes should be sent to the Government Botanist with specimens of the plants.

Specimens for identification should bear either flowers or fruits ("seeds") if these are available. If not, a good-sized sample of leaves and twigs should be sent. All samples should be accompanied by brief notes on the general appearance of the plant, the type of country, and the kind of soil.

2. *Condition of plants.*—With some plants, it is important to know whether they are green and succulent or old and dry. For example, plants which yield prussic acid, such as native couch grass and fuchsia bush, are most dangerous when green and succulent.

3. *Stage of growth.*—Some plants (for example, noogoora burr) are poisonous when seedlings but not when mature; others, such as heart-leaf poison bush, are said to be safe in the seedling stage but poisonous when mature.

4. *Condition of the animals.*—The physical condition of the animals is very important. Prime, well-fed sheep may eat quite safely some plants that would kill poor, hungry sheep. Hungry sheep often eat plants which are left untouched by well fed sheep. Mortalities on native couch grass near St. George provided a good example of this. Deaths occurred only in very hungry sheep travelling from a bare stock route. Well fed sheep from a better grassed route passed along the same lane without loss.

Though as a general rule hungry sheep are more susceptible to plant poisoning than others, with a few plants only prime animals are affected.

5. *Routine.*—It is important to know whether animals are grazing quietly in the paddock, travelling along a stock route or being mustered or handled in yards. In general, any handling of sheep increases the risk of losses through plant poisoning.

6. *Previous history.*—After eating certain plants such as Ellangowan poison bush the animals may show no symptoms for some time, often several days. Therefore, when searching for poisonous plants, stock routes should be examined over the distance travelled by the animals during the three days before deaths occurred.

A drink of water may hasten the onset of symptoms so it is well to note when and where the animals were watered.

Driving sometimes causes symptoms to appear which otherwise would not show, for example in "humpyback" only driven animals show symptoms.

Loud noises and sudden fright bring on symptoms of yellow-wood poisoning in sheep.

The history of sheep unloaded from railway trucks is specially important. Such sheep are very susceptible to plant poisoning. Even with paddock sheep, history can be important, as will be explained under paragraph 8.

7. *Seasonal conditions.*—In some plants the amount of poison fluctuates from month to month and from year to year. The actual nature of this seasonal variation has been worked out for a few plants and similar variation is believed to exist in many others which have not yet been studied critically.

8. *Weather conditions.*—In certain circumstances, weather can be a potent factor in causing mortalities in sheep. For example, the following case was noted in the Blackall district some years ago. For several months, strong wethers had been running in a paddock containing gidyea with some open grassy plains. Along the fringe of the timber were many well-grown fuchsia bushes, which were kept fairly well trimmed by the sheep. During one week there were two days of cold, drizzling weather and the sheep remained huddled in the timber, not feeding out. On the third day the weather cleared and the sheep left the timber and ate the fuchsia. A great number died. The sheep were hungry, there was some young growth on the bushes and the leaves were wet. All these factors helped to make the plant more dangerous, and in combination they proved fatal even to sheep accustomed to eating the plant.

Prevention and Treatment of Plant Poisoning.

It is better to prevent plant poisoning than to try to cure affected animals. The first essential is to recognise the plants responsible so that steps may be taken to avoid them. In known "poison" country, it may be possible to devise a system of management whereby losses can be reduced to a minimum. This applies particularly to unpalatable plants which are eaten only when other feed is scarce. Where possible, paddocks containing many of these plants should be grazed in flush seasons when other feed is plentiful. Comparatively safe country may then be reserved for drier times.

Remedies are available for only a few kinds of plant poisoning. Their effectiveness depends upon correct diagnosis and quick administration. The following three remedies are recommended by the Department:—

(*a*) *Hypo treatment*: Used when animals are suffering from prussic-acid poisoning caused by eating plants such as fuchsia bush, boonaree, native couch grass, and red crumbweed.

Sodium thiosulphate (photographic hypo), 5 ounces (avoirdupois).

Water to make 1 pint.

Drench once per day with 2 fluid ounces of the solution.

(*b*) *Methylene blue treatment*: Used when animals are suffering from methaemoglobinaemia (a condition in which the blood cannot take up oxygen) caused by eating mint weed or other plants containing excess nitrate.

Make up 0.9 per cent. saline solution as follows:—

Sodium chloride (salt), 9 grams or 138 grains.

Distilled water to make 1,000 cc. or 35 fluid ounces.

When dissolved, add methylene blue as follows:—

Methylene blue, 6 grams or 92 grains.

Saline solution to make 1,000 cc. or 35 fluid ounces.

Dose.—10 cc. injected beneath the skin or into a vein. A second treatment may be necessary.

(*c*) *Calcium borogluconate treatment*: Used to treat hypocalcaemia (deficiency of calcium in blood) in animals suffering from soda bush poisoning.

Calcium borogluconate, 200 grams or 7 ounces (avoirdupois).
Warm water (distilled), 1000 cc. or 35 fluid ounces.
Dose.—30 to 50 cc. injected beneath the skin.

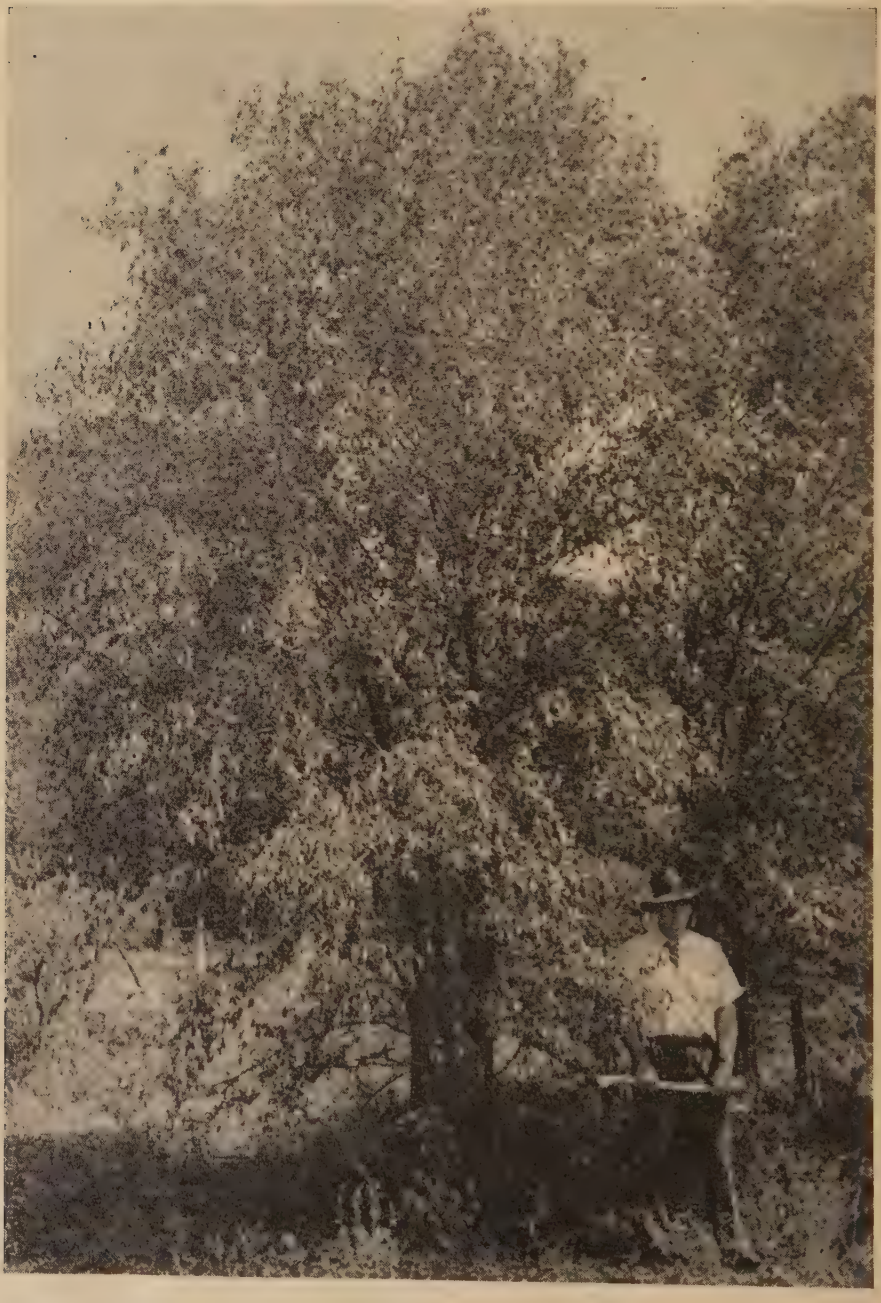


Plate 4.
YELLOW-WOOD.—Mature tree, Emerald.

Arrangement.

The plants have been divided into four categories and arranged in the following order:—

Trees: Yellow-wood, boonaree.

Shrubs: Fuchsia bush, heart-leaf poison bush, Ellangowan poison bush.

Vines: Caustic vine, weir vine.

Herbs and Grasses: Soda bush, mint weed, wild sunflower, sunflower daisy, darling pea, dwarf darling pea, thorn apple, wild tobaccos, caustic creeper, bottle-tree caustic, flax weed, common native couch, andrachne, red crumbweed, malvastrum, wild parsnip, plants causing photo-sensitisation.

Yellow-wood.

Other Common Names: None reported. The plant should not be confused with the tall timber tree of the same name found in coastal rain-forests.

Botanical name: Terminalia oblongata, F. Meull.

Description: Bushy, deciduous tree up to 25 feet high; bark grey, furrowed; wood yellow, fine-grained; leaves alternate, often in clusters along the branches, bright green when young, becoming yellow or reddish when old, 1 to 1½ inches long, oblong, rounded or slightly notched at the tip; flowers small and inconspicuous, fruits up to 1 inch in diameter, greenish-yellow, with dry wings. (Plate 4.)

Distribution: So far as is known, this tree grows only in the area drained by rivers of the Burdekin and Fitzroy systems. It is found mainly in mixed forest country, on soils ranging from heavy clay to sandy loam.

Seasonal Occurrence: In dry years, trouble may be experienced at any time. In good years, most cases occur in the dry months from June to December.

Evidence of Poisoning: (*a*) Field: For many years the plant was suspected of causing a peculiar staggers in sheep. Field surveys carried out in 1940 and 1941 by departmental officers* suggested that it might be the cause of Mackenzie River disease in cattle.

(*b*) Feeding tests: In 1934, sheep given as much yellowwood leaf as they would eat for periods ranging from 5 to 8 weeks exhibited symptoms similar to those observed in the field.† In feeding tests at Clermont in 1944 with young Shorthorn cattle symptoms were produced similar to those of Mackenzie River disease as seen in the field.‡ First symptoms were noticed in from 10 to 20 days after feeding began.

Symptoms: In sheep, symptoms appear only when the animals are frightened, as, for example, by loud noises. The symptoms have been reported as follows†:—"The sheep drops in its tracks as though stunned

* Irving Marshall: Unpublished reports, Department of Agriculture and Stock files, 1940-1941.

* Francis, W. D.: Unpublished report, Department of Agriculture and Stock files, 1941.

† McIntosh, K. S.: Queensland Agricultural Journal, Vol. 42, p. 727, 1934.

‡ Legg, J., Moule, G. R., and Chester, R. D.; Queensland Journal of Agricultural Science, Vol. 2, p. 199, 1945.

and lies trembling and rigid with extensor muscles of the neck and limbs strongly contracted. The sheep sometimes lies quite prone and sometimes props itself up and sways its head from side to side. The attack lasts for 10 to 40 seconds and recovery is quick. The sheep struggles to its feet and stands for a few seconds swaying unsteadily, then runs away to join the mob.'' No deaths from yellow-wood poisoning have been reported in sheep, but some mortalities have occurred when sheep have taken fits on the edges of waterholes or dams and have fallen in and been drowned. In the yards, affected sheep may take fits when being handled.

The following symptoms have been observed in cattle*:—At first, there is continuous blinking and marked disinclination to stay in the sun. There is a thin, yellowish discharge across the face which mats the hair. Later, the head is held high. In some cases sight is probably impaired and the animal lifts its forefeet a little higher than normal. The muzzle becomes inflamed and cracks and incrustations appear. There may be a slight discharge from the nostrils. Sometimes there is a swelling under the jaw and in the brisket region. Urination is more frequent than normal and occasionally there is almost continuous dribbling.

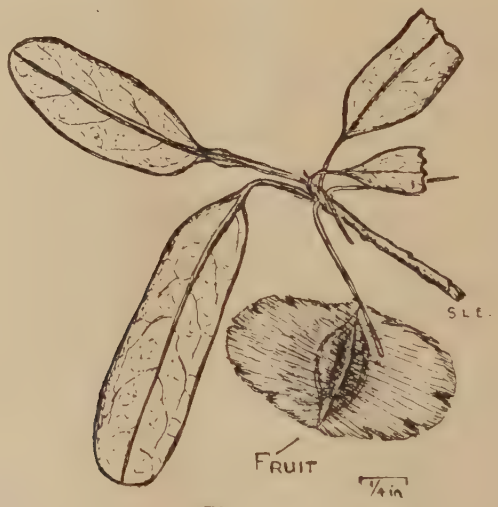


Plate 5.
YELLOW-WOOD.—Twig with leaves and fruit.

Post Mortem: No post mortems are reported for sheep. In cattle, the main changes are in the kidneys which show a peculiar discolouration, ranging from greenish-blue to slate-grey and considerable congestion.

Prevention: The tree is so plentiful that eradication is impossible. Sheep running on yellow-wood country should be disturbed as little as possible. If country free from the tree is available, it should be reserved for dry periods and the yellow-wood country stocked when grass and herbage are plentiful. Sheep on good grass rarely eat enough yellow-wood to cause trouble.

Treatment: No remedial treatment is known.

* Legg, J., Moule, G. R., and Chester, R. D.; Queensland Journal of Agricultural Science, Vol. 2, p. 199, 1945.

Boonaree.

Other Common Names: Dogwood, rosewood, red heart.

Botanical Name: *Heterodendron oleifolium* Desf.

Description: Bushy tree up to 25 ft. high; bark dark grey, furrowed and broken into rough flakes; sapwood yellow; heartwood reddish-brown; leaves alternate, pale, dull green, up to 3 in. long, veins well marked; flowers inconspicuous, pale green; fruits in clusters, 1-4 celled, cells rounded, green, about ¼ in. across (Plate 6).

Plate 6.
BOONAREE.—Mature tree, Blackall.

Distribution: The tree is very common in central and south-western Queensland and is also plentiful in western New South Wales. It grows on a variety of soils and occurs chiefly in mixed forest country.

Seasonal Occurrence: Trouble most often occurs when a light shower of rain or heavy dew falls on lopped branches, particularly when young growth is present on the trees. It is most dangerous after summer rain.

Evidence of Poisoning:

(*a*) Field: This tree is commonly lopped for fodder in drought time. A number of cases have been reported where hungry sheep have died after feeding on loppings.

(*b*) Feeding tests: No feeding tests have been reported.

(*c*) Chemical: The plant contains a cyanogenetic glucoside (a combination of prussic acid and sugar). Monthly tests by the Queensland Agricultural Chemist showed that this was at a maximum in the summer and that young leaves contained more than old leaves.

Plate 7.

BOONAREE.—Twig with leaves and fruit.

Symptoms: Symptoms of boonaree poisoning have not been recorded but most likely they are similar to those produced by other prussic-acid yielding plants such as fuchsia bush (see page 22).

Post Mortem: The condition on post mortem has not been reported but possibly resembles that given on page 22 for fuchsia bush poisoning.

Prevention: It is best not to lop the tree for fodder, but if lopping is necessary, care should be taken to see that hungry sheep do not get large quantities, especially if there is much young growth. The danger of poisoning would be reduced by allowing the cut material to dry off before feeding.

Treatment: Immediately they show signs of poisoning, affected animals should be given the hypo treatment (see page 15).

Fuchsia Bush.

Other Common Names: Native fuchsia.

Botanical Name; *Eremophila maculata* F. Muell.

Description: Densely branched shrub 2-3 ft. high; leaves green, ¾-1½ in. long, tapering at both ends; flowers about 1 in. long, borne singly on slender curved stalks, usually dark red outside except for yellow

Plate 8.
FUCHSIA BUSH.—Mature plant, Blackall.

shading at the base of the tube, spotted inside and on the drooping lower "petal"; fruits up to 1 in. in diameter, the style persistent like a whisker on the end (Plate 9).

Distribution: In Queensland, the plant ranges widely over the western areas from the southern border to the Gulf. It grows best on the richer soils and often favours the edges of brigalow and gidyea scrubs, though it is not confined to such situations.

Seasonal Occurrence: Fuchsia bush is most dangerous after summer rain but is potentially dangerous at all times.

Evidence of Poisoning:

(*a*) Field: Throughout the sheep-raising districts, the plant has the reputation of being poisonous to travelling sheep. Paddock sheep appear to eat it without ill effect, trouble being experienced only under exceptional circumstances (see page 15).

(*b*) Feeding tests: In 1910, feeding tests in Queensland showed that sheep which ate about half a pound of green leaves died in an hour or less. In feeding tests in New South Wales the plant proved fatal to sheep when enzyme (to liberate the prussic acid from its chemical combination with sugar) was added to the material eaten. Tests without enzyme were inconclusive.

(*c*) Chemical: The plant contains very large quantities of cyanogenetic glucoside. Monthly tests by the Queensland Agricultural Chemist showed a marked fluctuation in the amount of glucoside present.

Plate 9.
FUCHSIA BUSH.—Twig with leaves and flowers.

Samples collected after heavy summer rain (January-February) yielded the greatest amount of prussic acid and those collected in a dry October yielded least. The amount of glucoside present appears to depend on the quantity of young leaves in the sample.

Symptoms: Affected animals usually show trembling or twitching of the muscles, accelerated pulse and deep breathing, then fall down. Death usually occurs quickly, often within half an hour.

Post Mortem: Lesions on post mortem are not marked, though there is commonly a little reddening of the paunch.

Prevention: It is well known that paddock sheep eat this plant without ill effect, despite the fact that the plant contains enough glucoside to kill. Apparently in well fed sheep the prussic acid is not released from the glucoside. In hungry animals it is. At the time when the plant is most dangerous (after summer rain) other feed is abundant and it is unlikely that paddock sheep would eat much fuchsia at such a time.

The real danger is with hungry sheep travelling over stock routes with little else but fuchsia bush. The plant is dangerous to such sheep at all times. If possible, travelling sheep should be given hay or a good feed of grass before being driven through big stands of fuchsia.

Treatment: Affected animals should be given the hypo treatment immediately symptoms are noticed. (See page 15.)

Heart-leaf Poison Bush.

Other Common Name: Desert Poison. Although the Queensland plant is not the true heart-leaf poison bush, it is usually known by that name in this State. The true heart-leaf grows only in Western Australia.

Botanical Name: Gastrolobium grandiflorum, F. Muell.

Description: Shrub up to 6 ft. high with several slender stems from a woody tuber just below ground level; leaves opposite, dull bluish-green, 1-2 in. long, ¾-1 in. wide, elliptic in outline, tapered at the base into a short leaf-stalk, often notched at the tip, brittle, leaves on seedlings heart-shaped, hairy; flowers pea-shaped, ¾-1 in. long, petals dark red and very showy; pods small, yellowish-brown, tapered at both ends, hairy, usually containing one seed about the size of a sweet-pea seed.

Distribution: Heart-leaf poison bush grows on yellow sandy soil in poor forest ("desert") country, mainly between Yalleroi and the Newcastle Range. It has been found as far south as Jundah and as far east as Herberton. It occurs also in the Gulf country, the Northern Territory and Western Australia.

Seasonal Occurrence: A conflict of opinion exists as to whether the plant is more poisonous at one season than another. There is no reliable information on this point.

Evidence of Poisoning:

(*a*) Field: Many cases have been reported where heart-leaf poison bush was suspected of killing sheep. Graziers who know it are generally agreed that the plant is poisonous in nearly all stages except, perhaps, when very young, that the leaves are poisonous either green or dry and that all kinds of herbivorous animals are affected except, perhaps, the native marsupials.

Some state that seedlings less than 6 in. high are not poisonous and that they do not become poisonous until the tuber is formed. As yet, this point has not been confirmed. Some vague statements have been made that it is not poisonous at other stages but no definite information is available regarding this.

(*b*) Feeding tests: In tests at Yeerongpilly wethers were killed within 24 hours by as little as ½ lb. of the ground-up leaf.*

(*c*) Chemical: In Western Australia several alkaloids were isolated from allied species but although work is proceeding on the Queensland plant no definite information is yet available.

Symptoms: It has been reported that affected animals showed a very proppy, stiff gait and trembling of the extremities and chin. In most cases animals were found dead.*

Post Mortem: Slight congestion of the lungs, fourth stomach, and small intestines has been observed. In some animals slight congestion was noticed in the liver and kidneys.

* Legg, J.; Minutes of Queensland Poison Plants Committee, 1940.

Plate 10.
HEART-LEAF POISON BUSH.—Mature plant, north of Aramac.

Prevention: "Poison" country is definitely unsafe for grazing until the heart-leaf poison bush has been eradicated. This is usually done by grubbing out the plants, taking care to cut the stems below the tubers. The cut material is allowed to dry, then burnt. As the young seedlings come up, sheep are crowded into the paddock to eat them down. It is important to be sure the young plants *are* seedlings and not suckers from the old roots. Suckers will come up only if the original grubbing has been done badly.

There is a possibility that prolonged heating of the cut leaves will destroy the poisonous principle but this is still not certain. Until definite proof is available, it is better to regard the cut leaves as dangerous.

Plate 11.
HEART-LEAF POISON BUSH.—Seedlings, note hairs on young leaves.

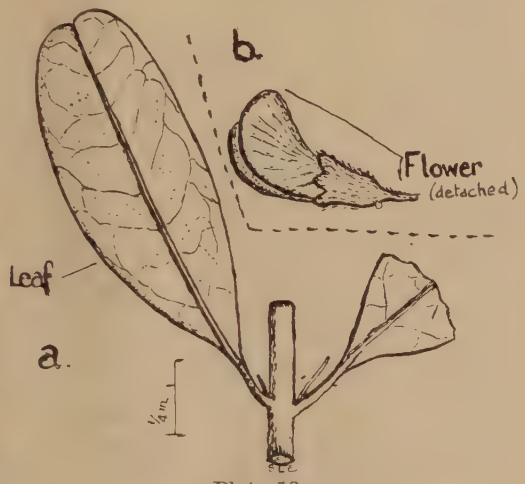


Plate 12.
HEART-LEAF POISON BUSH.—(*a*) Twig showing leaf.
(*b*) Flower (detached).

Treatment: In Western Australia potassium permanganate, or Condy's crystals, was found an effective antidote, the dose for a sheep being 10 grains dissolved in water and administered as a drench. Addition of aluminium sulphate increased the effectiveness of the permanganate solution. So far as is known, the treatment has not been tested in Queensland.

[TO BE CONTINUED.]

MOST DOGS HAVE A REASON FOR BARKING.

"Chubb," Werris Creek, writes:—Years ago, while living on the land, we had several cattle dogs, whose kennels were beside the horse yards and saddle room. One night we had a few friends in to play ping pong. Of course there was quite a deal of laughing going on which we thought was giving the dogs a good reason for all the barking they were doing; therefore no one bothered to go out to the dogs.

Next morning it was easy to see what had caused the barking. When we went to the yard there were two tired sweat-covered horses standing with their heads down, saddles and bridles thrown on the ground. A few days later we discovered that two men who were working on the road nearby had taken our horses and saddles and ridden to a hotel 20 miles away, drank most of the night, and returned putting the weary horses back before dawn.

—*The Land* (Sydney).

PLANT PROTECTION

The Use of D.D.T. on Some Vegetable Crops.

J. HAROLD SMITH, Senior Entomologist.

DURING the past two or three years, the value of the insecticide, D.D.T., for the control of many important insect pests has been demonstrated in Queensland and elsewhere. The killing power of such an insecticide is, of course, only one of many factors which determine whether or no it can be safely used on the farm; the reaction of the crop to commercial preparations containing it, the efficiency of the insecticide when used with other materials and the habits of the insect pest must be considered before existing control practices are modified. New recommendations for the control of an insect pest are normally issued after the completion of both field and laboratory experimental work. Recently, farmer usage has sometimes gone beyond existing recommendations and a statement on the part which D.D.T. may play in pest control work on tomatoes, cucurbits, and beans should illustrate some of the difficulties so far encountered with this insecticide.

Tomatoes.

Tomatoes are grown extensively in all parts of the State and, provided pests and diseases are controlled, the crop yields good returns to the farmer. Considerable sums are therefore spent by farmers each year on the purchase of combined dusts containing both insecticides and fungicides. Such combined dusts lower the labour costs incurred in the application of control measures and are designed primarily to check corn ear worm, tomato mite, and target spot, which respond to lead arsenate, sulphur, and a copper fungicide respectively. In practice, these combined dusts are applied at intervals of seven to fourteen days, depending on the anticipated activity of pests and diseases. When corn ear worm gets out of hand, the farmer either reduces the period between successive applications of the combined dust or inserts a straight lead arsenate dust between successive applications. In short, he doubles up his treatments in order to make sure that lead arsenate is always present on those parts of the plants attacked by corn ear worm.

D.D.T. is, of course, just as, if not more, efficient than lead arsenate for the control of corn ear worm. It has an advantage, too, in that the residues left on the fruit by routine treatment schedules on the growing crop are less hazardous to the consumer. Combined dusts containing D.D.T., copper carbonate and sulphur have consequently been used in some parts of the State. The results, judged by the control of corn ear worm obtained, have not been altogether satisfactory and user-verdict agrees with the results of experimental work to date here. It appears that the efficiency of D.D.T. may be impaired by the copper carbonate in combined dusts, at least in Central and Northern Queensland. The cause of the phenomenon has yet to be determined. However, the field picture is quite clear and tomato growers should, for the time being, consider such dusts as of experimental interest only. Actually, former

control schedules entail no hardship, for lead arsenate has a high level of efficiency for the control of corn ear worm. It is suggested, therefore, that lead arsenate—copper carbonate—sulphur dusts be used on a regular seven to fourteen-day schedule as in the past. If corn ear worm is very active, additional applications of either a 50 per cent. lead arsenate or a 2 per cent. D.D.T. dust may be applied between successive treatments to keep it in check. If both corn ear worm and target spot require special attention, a lead arsenate–copper carbonate dust would, of course, be the extra dust applied in practice.

Cucurbit Crops.

The principal pests of cucurbit crops such as the cucumber, squash, pumpkin and melon, are pumpkin beetles, leaf-eating ladybird, onion thrips and red spider.

Control recommendations for these pests require the use of lead arsenate dusts with or without sulphur and/or nicotine, depending on the presence of red spider and or thrips respectively. Copper carbonate may be included in lead arsenate dusts applied to those cucurbits which are susceptible to downy mildew. D.D.T. is of interest to farmers as a possible control measure for pumpkin beetles and the leaf-eating ladybird, both of which are readily killed by the insecticide. The first of these two pests is particularly injurious to young plants and at least weekly applications of a lead arsenate dust are often required in the early stages of growth to keep it in check. Such a schedule is exacting and a more efficient insecticide would have much in its favour. Sprays and dusts containing D.D.T. have therefore been used fairly extensively on young crops. Unfortunately, some plants in the cucurbit family are very susceptible to D.D.T. sprays and dusts and injury has been recorded in many districts. This may take the form of necrotic lesions on the foliage and the stem. Sometimes the plants are killed. Perhaps equally serious from the grower's point of view is the fact that, even when no injury is apparent, growth may be temporarily suspended and gradually resumed later after a period of one or two weeks. Such a setback may affect financial returns to the grower, for some cucurbits, such as melons, are grown for specialised markets.

Sprays containing D.D.T. appear to be more injurious than dusts but it seems inadvisable to use either on cucurbit crops until more experimental data are available.

Beans.

The principal pests of edible beans are the bean fly, bean pod caterpillars and bean thrips.

The first of these is by far the most serious and as attacks commonly occur shortly after germination, protective treatments are required. Bean fly was formerly controlled by white oil-nicotine sulphate sprays, but D.D.T. has proved a more effective insecticide. However, the growth rate of the plant, rather than the residual effect of the D.D.T., dictates the period between treatments. Dusts applied at 3-4-4-4 day intervals after the commencement of germination in the field have proved satisfactory, but farmer practice favours a 3-4-3-4 day schedule, as this fits in better with working programmes. Sprays have longer residual effects than dusts and once the plants are well established, a weekly period between treatments is permissible. Working spray schedules

require treatment three days after the commencement of germination, four days later, and at seven-day intervals thereafter. Three spray applications should normally be adequate but a fourth may be needed in late summer and autumn, when the pest is usually very active.

The value of D.D.T. against bean pod caterpillars and bean thrips has not been determined as yet. The insecticide may, however, prove suitable for the control of the former insect as arsenicals cannot be used on fruiting crops.

Other Vegetable Crops.

Many pests attacking other vegetables can be controlled with D.D.T. in dust or spray forms. If treatment is applied when injury is first noted in the crop, outbreaks of leaf eating pests such as the cabbage moth and the brown vegetable weevil may be checked, though additional applications of the insecticide may be needed during the remainder of the growing period. When the pest lives within the plant tissue as in the case of the centre grub of cabbage, treatment may prevent new attacks, but it has little effect on insects already established in the leaves or the stems. Consequently, in districts where these and similar pests are known to be active, it is wise to apply the insecticide regularly during the most vulnerable period in the growth of the plant, i.e., when the plants are young. This may require treatment at fortnightly intervals from germination.

Dust versus Sprays.

It should be noted that sprays containing D.D.T. are generally more effective than dusts provided equal coverage of the plant can be obtained. The superiority of the spray is due largely to the greater persistence of the insecticidal film left on the plant. Both forms of the insecticide are, however, of value to the farmer and his choice will, in practice, be made by the equipment available for applying the material, rather than the relative costs of application.

A BLESSING—AND A WARNING.

Present prosperity is a blessing and a warning, says "*A Rural Policy for Post-War Australia,*" a Commonwealth Government booklet on rural policy. The booklet states:—

During the war, primary producers, despite shortages of manpower and materials and adverse seasons, have enjoyed more stability of income than previously. On present indications the prosperity of the primary industries will continue for the next few years.

An estimate has been made of expected gross income over the period 1946-1950 which indicates a marked improvement over pre-war years.

This, together with a reduction in farm indebtedness of some 20 per cent. which has taken place during the war, will put farmers in a good position to meet intensified competition in world markets after that period.

The present period of prosperity should be regarded, however, as both a blessing and a warning.

Unless Governments and peoples apply themselves earnestly to the tasks of relating production to the needs of consumers, and unless primary producers themselves do all in their power to assist Governments to achieve this objective through increasing efficiency and by other means, there may well be a repetition after 1950 of the troubles which beset farmers the world over between the wars.

Infectious Labial Dermatitis (Scabby Mouth) of Sheep.

A. K. SUTHERLAND and G. R. MOULE, Veterinary Officers, Division of Animal Industry.

SCABBY mouth is the common name of a disease of sheep which is prevalent in Queensland. The condition is transmitted readily from sheep to sheep and is caused by a minute organism known as a virus.

The economic importance of the disease is that it may cause a transitory check in the development of young sheep.

Distribution and Incidence.

Scabby mouth occurs in all Queensland sheep-raising areas. It is most common in dry seasons when stubble is rough and hard and in seasons when there is a good deal of "red burr" in the pasture.

The disease is seen mainly in young sheep, and one attack confers a solid immunity. Accordingly it is rarely seen in older sheep.

Infective Material.

The virus which causes the disease is present in the scabs which develop during the course of the disease. These scabs drop off the sheep and so contaminate the pasture. In this way the disease spreads, and as the virus in the scab is very resistant to weather conditions infection persists from year to year.

Mode of Infection.

The virus which has contaminated the pasture enters the sheep's skin through small abrasions on the lips and face. Such abrasions are usually caused by eating dry, hard stubble or the prickles of the red-burr or similar plants. The virus can be transmitted to the udder of suckling ewes from the lips of affected lambs. The coronet may be affected when sheep with lesions on the lips bite their feet.

Course of the Disease.

An attack of scabby mouth takes about 14 to 18 days to pass off an affected animal. The disease runs through four typical stages—

(i.) Incubation, which is short—usually 24 to 72 hours;

(ii.) Blister formation, which does not last much longer than 3 to 4 days;

(iii.) Scab formation, which lasts about 8 to 15 days;

(iv.) Healing, which varies in length, but is usually short.

The disease may take 8 weeks or longer to run through a flock, and though many sheep are affected few die.

Plate 13.
TYPICAL CASE OF SCABBY MOUTH IN SCAB FORMATION STAGE.

Symptoms.

In the incubation period there is little to see. During the period of blister formation which follows, small blisters or blebs develop. These are slightly raised, reddened at the base, and filled with a clear watery fluid. The blisters are most commonly seen at the junction of the hairless skin lining the inside of the lip and the hairy skin of the outside.

The blisters develop into hard, dry scabs. These vary in colour from pale yellow to very dark brown and have a characteristic "heaped-up" wart-like appearance. They occur commonly at the angle of the mouth, but may occur also under the chin. Plates 13 and 14 show typical cases of the disease in the scab formation stage.

Secondary infection with other germs sometimes develops, and when this happens the scabs are under-run with pus, which may be creamy-yellow and have an objectionable odour and appearance.

If secondary infection does not occur the lesion is dry. Removal of the scab reveals that the tissue underneath is raw and granulating and may bleed freely.

When the disease has run its course the flesh under the scabs heals and the scabs drop off. The rate at which healing takes place depends upon the presence and the type of bacteria causing the secondary infection, if such is present. After the scabs drop off the animals are no longer infective.

Lambs with sore lips are disinclined to eat, hence they may lose condition.

Plate 14.
Showing Typical Infectious Labial Dermatitis Scabs.

Diagnosis of Scabby Mouth.

The disease is fairly easily recognized by the appearance of the lesions, particularly when many animals are affected.

However, similar lesions may be caused by other agents. Mycotic dermatitis lesions on the face may be confused with scabby mouth.

The former is caused by infection of the skin by a fungus-like micro-organism. It usually occurs on woolled parts of the body, producing "lumpy wool," but infections on the face have been seen. Usually one sees odd cases in a flock.

Diagnosis can be confirmed by sending some of the scabs to one of the Animal Health Stations.

Treatment of Affected Sheep.

Sheep suffering from scabby mouth can be treated effectively by drafting off the affected animals and applying 5 per cent. copper sulphate (bluestone) solution to the lesions. This solution is made by adding ½ lb. of bluestone to 1 gallon of water. Using a swab stick or an old scrubbing brush, the solution is applied forcibly to remove the scabs and let the bluestone get to the raw skin. Sheep treated in this way make a rapid and uneventful recovery.

In some outbreaks it may be advantageous to vaccinate all the sheep in an affected flock as described in the next section.

Vaccination.

Sheep can be effectively immunized against scabby mouth by vaccination. The inoculation of the vaccine is very simple. The immunity produced lasts for at least two and a-half years, and probably for the lifetime of the average sheep.

The best time to vaccinate is at marking time, but sheep of any age can be done. A solid immunity develops about three weeks after vaccination. If a flock of sheep affected with scabby mouth is vaccinated then the outbreak subsides in a few weeks. It is reported also that vaccination accelerates the healing of lesions in affected sheep.

Infectious labial dermatitis vaccine is supplied in two containers, one of powder (virus) and the other of diluting fluid. The powder and the liquid are mixed immediately before they are required for inoculation. The sheep are vaccinated by lightly scratching the skin with a special needle which has been dipped in vaccine. The instrument used for inoculating the vaccine is a darning needle cut through the eye with a pair of pliers to make two points, and then mounted in a special needle holder or in a piece of wood (Plate 15).

To vaccinate the lamb it is held over a rail with the bare skin on the inside of the thigh exposed. The operator dips the needle in the vaccine and makes a light scratch about 1½ to 2 inches long on the bare skin. The needle is again dipped in the vaccine and a second, similar scratch is made parallel to and about ½ inch away from the first scratch. The scratches should be just sufficient to break the top layer of the skin but not deep enough to draw blood. The two prongs of the needle hold a small amount of vaccine which is deposited in the skin as the scratch is made. The needle collects grease and dirt from the sheep's skin, so it should be wiped on a piece of cotton wool after each scratch is made. Several dozen needles should be prepared and sterilized so that a new needle can be used after each batch of 100 sheep is done. Needles are best sterilized by placing them in a bottle and heating in a hot kitchen oven for an hour.

Unfortunately lambs cannot be vaccinated in lamb-marking cradles, because the site of inoculation is not exposed when the lamb is held in the cradle. However, it is quite easy to vaccinate immediately before the lamb is placed in the cradle. The inoculation is so simple that it does not delay the lamb-marking procedure, but one extra man in addition to the usual catching and marking team will be required in most cases to do the vaccinating.

Plate 15.
Vaccination for Infectious Labial Dermatitis.—Site of vaccination is inside thigh. The sheep is held as for lamb-marking, except that the site is exposed for vaccination.

Scabby mouth lesions develop at the site of inoculation. These appear about 4 days after vaccination as raised red spots, and a few days later most of them have developed into small pustules. Dry scabs are present about three weeks after vaccination, and at four weeks these have usually dropped off and the skin is healed. The lesions produced by vaccination are referred to as "takes." Sheep which are immune to the disease as a result of either natural infection or previous vaccination will not develop "takes." If vaccination does not take in susceptible sheep this may be due to inefficient inoculation or to vaccine of low potency. The aim should be to produce "takes" in all susceptible sheep vaccinated, and to achieve this

instructions regarding handling of vaccine and inoculation should be carefully followed. Susceptible sheep must develop a "take" to develop immunity.

It should be noted that the vaccine contains live scabby mouth virus and therefore must be handled with care. The vaccinator should avoid contaminating human skin or parts of the sheep other than the site of inoculation with the vaccine. The cotton wool on which the needle is wiped and also unused vaccine should be burnt at the end of the day's inocultions.

Plate 16.

SUCCESSFUL INFECTIOUS LABIAL DERMATITIS VACCINATION.—Inside of thigh of sheep showing "take" after vaccination.

A few vaccinated lambs may bite the site of inoculation and so develop lesions on the lips. These are not serious and they heal quickly.

As the scabs which are shed by vaccinated sheep contain scabby mouth virus, the adoption of vaccination could be the means of infecting a property on which the disease had not previously occurred. However, scabby mouth is so widespread that it is very doubtful whether such a property exists in the sheep-raising country of Queensland.

Recommendations on the Use of Vaccination.

The following is a guide to the conditions under which sheep-raisers should vaccinate against scabby mouth:—

1. Fat lambs may suffer a setback as a result of scabby mouth, so on properties where outbreaks have occurred it would be wise to vaccinate the lambs at an early age.

2. If a serious outbreak occurs, the whole flock should be vaccinated; all susceptible sheep would thereby be immunized.

3. On properties where scabby mouth is prevalent, all lambs should be vaccinated at marking time as a routine procedure.

Supply of Scabby Mouth Vaccine.

Vaccine is prepared at the Animal Health Station, Yeerongpilly. The smallest amount of vaccine which it is convenient (for technical reasons) to prepare is 10 c.c. This volume will vaccinate at least 500 and probably 1,000 or more lambs and costs £1 per bottle.

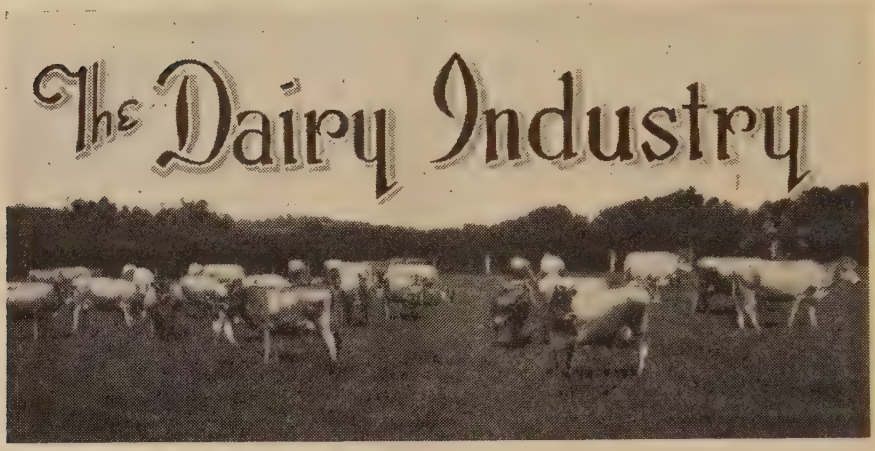
Vaccine will be issued only through field officers of the Department's Division of Animal Industry, so graziers requiring vaccine must order it through their nearest veterinary officer, inspector of stock, or adviser in sheep and wool.

WILL ARTESIAN WELLS RUN DRY?

A recent discussion on the diminishing flow of many bores brought artesian well water again into the top line news. Australia has the world's greatest artesian basin which extends over 590,000 square miles, mostly in Queensland with an overlap into adjoining portions of the Northern Territory, South Australia, and New South Wales. Ever since the first bore tapped the subterranean water-bearing strata there has been speculation as to if or when this great spring would go dry. In Queensland and New South Wales alone, the daily flow of artesian bores is estimated at 293 million gallons, and the duration of this flow has been conjectured from time to time for over the last 50 years.

The first flowing bore in Australia was sunk in 1878 at Kallara Station, on the western side of the Darling River, in New South Wales. That bore is still flowing, though at a reduced rate. However, it was not until nearly 1900 that a real start was made on tapping the vast underground reservoir of artesian water. The development of bore water supplies since then is a fascinating story. Although observations have shown that the flow from the bores is decreasing, the general view is not unduly pessimistic. The most hopeful factor is that, although the flow is diminishing the rate of diminishment is slowing down. Some men of science who have closely studied the question believe that the intake of rain water through the centuries is a permanent replenishment of the artesian reservoir, and that eventually the flow from the artesian basin will ebb to a permanent minimum. It is the extent of this permanent supply that an attempt is being made to determine.

Whether the ultimate flow will be adequate for the needs of the pastoral industry only time will tell. Meanwhile, the theory is that the flow will be satisfactory for another 200 or 300 years. By then, no doubt, surface water conservation shall have reached such a stage that the duration of artesian supplies may not matter so very much.



The Determination of Milk Solids and its Applications.*

L. A. BURGESS, A.A.C.I., Dairy Technologist.

AN accurate chemical analysis is the only infallible method of determining the exact composition of a sample of milk. This is laborious and unsuitable for routine work at milk depots, cheese factories, &c., for whose purposes rapid methods have been evolved which are remarkably accurate for milks of normal character. All such methods lose their accuracy to a certain extent if the milk is abnormal, but in the majority of such cases the results are sufficiently unusual to indicate that an abnormal milk is being dealt with. Such methods include the Babcock and Gerber tests for fat, the formol titration method for casein, and the determination of solids by means of hydrometers. This article deals with the determination of solids in milk and buttermilk by means of hydrometers and methods of applying the results at milk depots, cheese and butter factories.

The first essential is to accurately determine the percentage of fat in the product under examination. This may be done by the Babcock method for milk and the normal butyl alcohol method for buttermilk. These methods have been given in detail in a previous article (1). The other equipment required is specified below.

(1) *Quevenne Lactometer* (see Plate 1).—This is a very sensitive specific gravity hydrometer for milk testing. Lactometers are graduated in "degrees" which represent the second and third decimal place of the specific gravity. For example, 32 deg. on lactometer represents a specific gravity of 1·032, 28 deg. represents 1·028, and so on.

Alternatively, a British standard density hydrometer for use in milk, such as is illustrated in Plate 2, may be used. The hydrometers are constructed in two ranges—(*a*) density of 1·025 to 1·035, for use in normal milks; (*b*) density of 1·015 to 1·025, for use in milks of low density and for buttermilks which usually contain a large proportion of added water. They are graduated to indicate density which is slightly different to the specific gravity on which the older Quevenne lactometer degrees are based. It is important that the operator should know which instrument is being used, as the formulæ used to calculate the total milk solids differ slightly for the two instruments.

* Reprinted, after revision, from the *Queensland Agricultural Journal* for September, 1939.

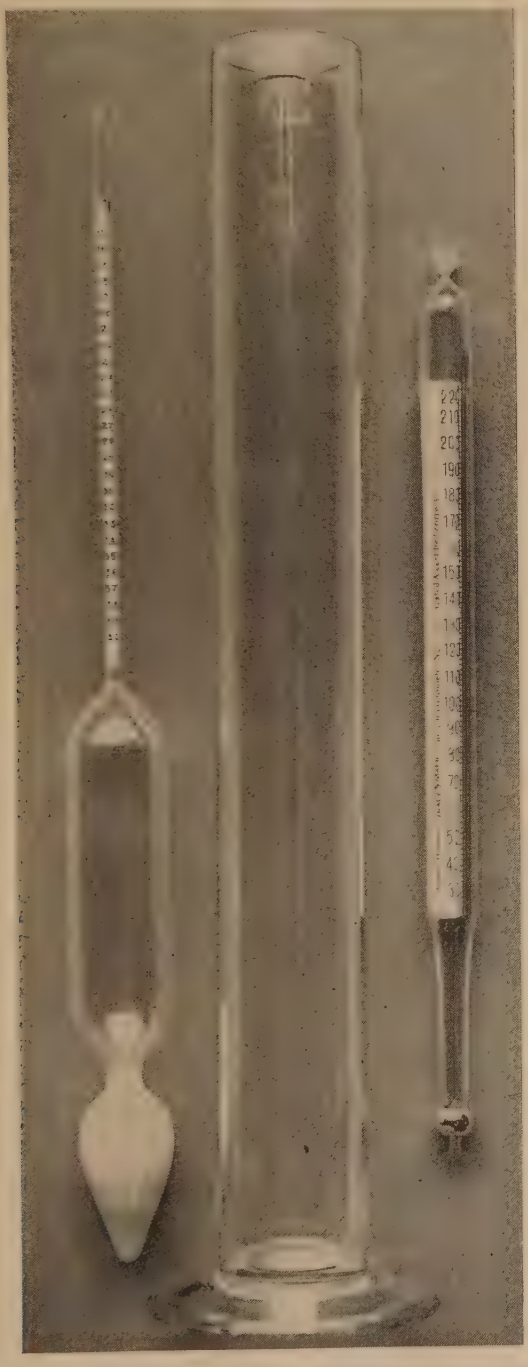


Plate 17.
A Quevenne Lactometer, Glass Cylinder, and Dairy Thermometer.

(2) *Cylinder* of glass or metal with the top finished off square and without a spout. The diameter should be sufficiently large to enable the lactometer to float freely without touching the sides, and the depth

should be approximately that of the total length of the lactometer. The cylinder should stand firmly without rocking in a true vertical position. A glass cylinder is shown in Plate 1, and the constructional details of a metal cylinder are shown in Plate 3. The dimensions given are for a British standard density hydrometer, size No. 1, and would require modification for other instruments.

(3) *Thermometer.*—If the Quevenne lactometer is used, an ordinary Fahrenheit dairy thermometer will be required. If the density hydrometer is used, a centigrade thermometer is preferable, although not essential.

Making the Readings.

If the milk shows no signs of churning the only precaution to be observed is to adjust the temperature to between 50 deg. F. and 80 deg. F. preferably between 60 deg. F. and 70 deg F. If the milk has been chilled

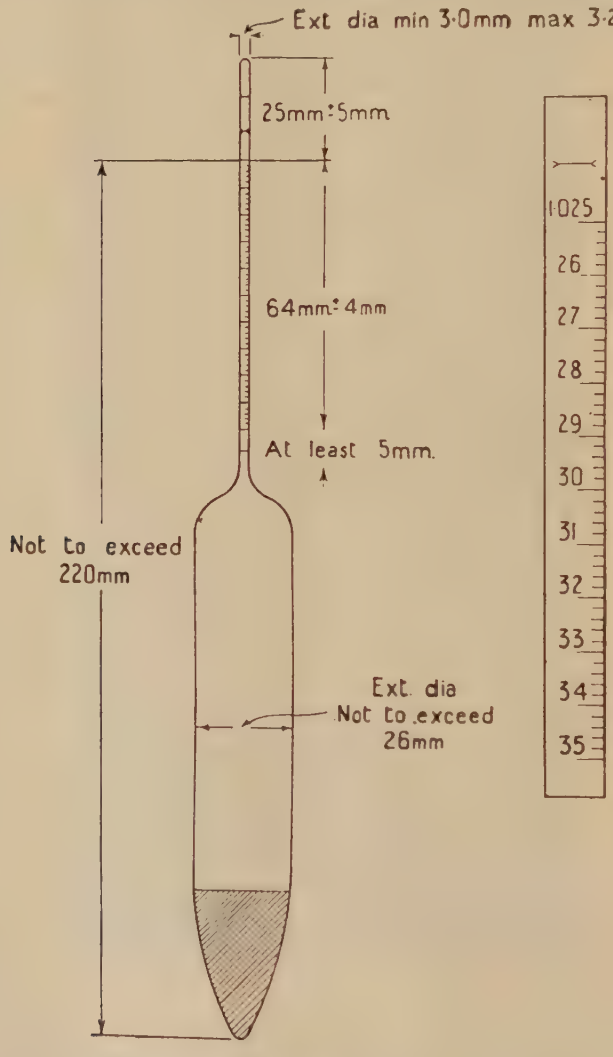


Plate 18.

BRITISH STANDARD DENSITY HYDROMETER FOR USE IN MILK, SIZE NO. 1.—Reproduced by permission from British Standard Specification No. 734—1937.

it is advisable to warm it up to a temperature of about 100 deg. F. and gently but thoroughly mix, then cool to about 70 deg. F. If the fat has been partly churned, it is essential to warm and mix as described. Do not mix so vigorously as to incorporate air bubbles, as this will make the reading incorrect. Sour milk cannot be tested.

Carefully pour the sample of milk into the cylinder so as to prevent the incorporation of air or formation of froth. The cylinder should be nearly filled, so that when the hydrometer is inserted the milk will overflow. Hold the hydrometer by the top of the stem, lower gently into the milk, and release when in its approximate position of equilibrium. The stem above the liquid should not be wetted with the milk for more than ¼ inch, as the weight of the adhering milk will be sufficient to make

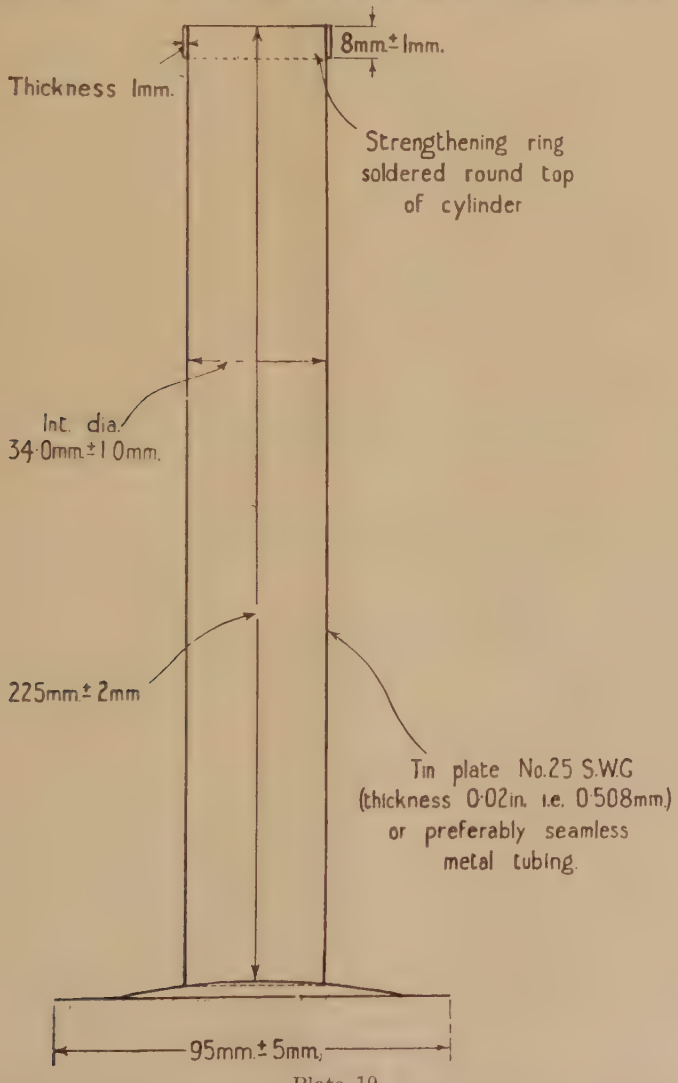

8mm.± 1mm.
Thickness 1mm.
Strengthening ring soldered round top of cylinder
Int. dia. 34·0mm.± 1·0mm.
225mm.± 2mm
Tin plate No.25 S.W.G (thickness 0·02in. i.e. 0·508mm.) or preferably seamless metal tubing.
95mm.± 5mm.

Plate 19.

CONSTRUCTIONAL DETAILS OF A METAL CYLINDER.—Reproduced by permission from British Standard Specification No. 734—1937. The dimensions given are for the British Standard Density Hydrometer, Size No. 1, and would require modifications for other instruments.

the hydrometer sink further into the milk and cause an inaccurate reading. When the hydrometer is at rest the scale reading is taken at the level surface of the milk, not at the top of the milk column around the stem of the hydrometer. To make the methods as uniform as possible the readings of the British standard density hydrometer may be recorded by omitting the digit and moving the decimal point three places to the right; for example, 1·0306 becomes 30·6 and so on. The scale shown in Plate 18 shows that this is easily done. In this way the readings become comparable to the Quevenne lactometer degrees and the calculation of total solids is simplified. For the sake of simplicity they will be called "Density Degrees." Withdraw the hydrometer and immediately introduce a thermometer and record the temperature of the milk.

TABLE I.

Temp. °Fah.	Observed Lactometer Reading.												Temp. °Fah.
	16.	18.	20.	22.	24.	26.	28.	30.	32.	34.	36.	38.	
50	0·7	0·8	0·8	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·3	1·4	50
52	0·6	0·6	0·7	0·7	0·7	0·8	0·8	0·9	0·9	1·0	1·1	1·2	52
54	0·4	0·5	0·5	0·5	0·5	0·6	0·6	0·7	0·7	0·7	0·9	1·0	54
56	0·3	0·3	0·3	0·3	0·4	0·4	0·4	0·4	0·5	0·5	0·6	0·7	56
58	0·1	0·1	0·1	0·1	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·4	58
	Subtract from the observed lactometer reading.												
60	No corrections at this temperature.												60
	Add to the observed lactometer reading.												
62	0·2	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·3	0·3	0·3	62
64	0·4	0·4	0·4	0·4	0·4	0·5	0·5	0·5	0·6	0·6	0·6	0·7	64
66	0·5	0·5	0·6	0·6	0·6	0·7	0·7	0·8	0·9	0·9	1·0	1·0	66
68	0·7	0·7	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·2	1·2	1·3	68
70	0·9	1·0	1·0	1·0	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	70
72	1·1	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·0	72
74	1·3	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·1	2·2	2·3	2·4	74
76	1·6	1·6	1·7	1·8	1·8	1·9	2·0	2·2	2·4	2·5	2·7	2·8	76
78	1·8	1·8	1·9	2·0	2·1	2·2	2·3	2·5	2·7	2·9	3·1	3·2	78
80	2·0	2·1	2·2	2·3	2·3	2·4	2·6	2·8	3·0	3·2	3·4	3·5	80
	16	18	20	22	24	26	28	30	32	34	36	38	

Corrections to be made to the Quevenne Lactometer readings to convert them to readings at 60° Fah.

Corrections for Temperature.

The Quevenne lactometer is graduated to give correct readings at 60 deg. F. If the temperature is not 60 deg. F., a correction must be made to the reading. Table 1 gives the corrections which should be applied at temperatures between 50 deg. F. and 80 deg. F.

The density hydrometer is graduated to give correct readings at 20 deg. C. (68 deg. F.), and Table 2 shows the corrections to be made for different temperatures between 15 deg. C. (59 deg. F.) and 27 deg. C. (81 deg. F.) when the fat ranges from 0 to 10 per cent.

TABLE II.

Temp. °Cent.	Fat Percentage.						Temp. °Fah. (nearest).
	0 Per Cent.	2 Per Cent.	4 Per Cent.	6 Per Cent.	8 Per Cent.	10 Per Cent.	
15	1·0	1·1	1·2	1·3	1·5	1·6	59
16	0·8	0·9	1·0	1·1	1·2	1·3	61
17	0·6	0·7	0·7	0·8	0·9	0·9	63
18	0·4	0·5	0·5	0·5	0·6	0·6	64
19	0·2	0·2	0·3	0·3	0·3	0·3	66
	Subtract from the observed reading.						
20	No corrections at this temperature.						68
	Add to the observed reading.						
21	0·2	0·2	0·3	0·3	0·3	0·3	70
22	0·5	0·5	0·5	0·6	0·6	0·6	72
23	0·7	0·8	0·8	0·8	0·9	0·9	73
24	1·0	1·0	1·1	1·1	1·2	1·2	75
25	1·2	1·3	1·4	1·4	1·5	1·6	77
26	1·5	1·6	1·7	1·7	1·8	1·9	79
27	1·8	1·9	2·0	2·0	2·1	2·2	81
	0 Per cent.	2 Per cent.	4 Per cent.	6 Per cent.	8 Per cent.	10 Per cent.	

Corrections to be made to the British Standard Density Hydrometer readings to convert them to readings at 20° Cent. (68° Fah.).

Calculation of Total Solids and Solids Not Fat.

(*a*) From Quevenne Lactometer Readings:—The lactometer reading at 60 deg. F. and the percentage of fat having been determined, the total solids may be calculated by means of the formula of the noted English dairy chemist, H. Droop Richmond.

Total solids = $\frac{1}{4}$ lactometer deg. + $1\frac{1}{5}$ fat + 0·14.

Example:—

Fat = 4·2%
Observed lactometer reading = 30·8 at 68° F.
Correction (from Table I.) = Add 1·1
Corrected lactometer reading = 30·8 + 1·1 = 31·9
Total solids = $\frac{1}{4}$ of 31·9 + $1\frac{1}{5}$ times 4·2 + 0·14

$$= \frac{31{\cdot}9}{4} + \frac{6 \times 4{\cdot}2}{5} + 0{\cdot}14$$

$$= 7{\cdot}975 + 5{\cdot}04 + 0{\cdot}14$$

$$= 13{\cdot}155.$$

Recorded as 13·2%.
The solids not fat (S.N.F.) would be 13·2 − 4·2 = 9·0%.

(*b*) From Density Hydrometer Readings.—The formula used is based on that of H. Droop Richmond, but is slightly different because of the slight difference between density and specific gravity.

Total solids = $\frac{1}{4}$ density deg. + $1\frac{1}{5}$ fat + 0·7.

[The British Standard Specification No. 734-1937 gives the official formula as:

Total solids = $\frac{1}{4}$ density + 1·21 fat + 0·66.

The modified formula shown in the text gives results sufficiently accurate (from + 0·03 to — 0·08) for all practical purposes.]

Example:—

Fat = 4·0%
Observed density degrees = 30·0 at 20° C. (68° F.)
Correction from Table II. = nil
Corrected density degrees = 30·0

$$\text{Total solids} = \frac{30{\cdot}0}{4} + \frac{6 \times 4{\cdot}0}{5} + 0{\cdot}7$$

$$= 7{\cdot}5 + 4{\cdot}8 + 0{\cdot}7$$

$$= 13{\cdot}0\%.$$

The solids not fat in this case is 13·0 − 4·0 = 9·0%.

The figures obtained by the above methods may be applied at milk depots, cheese factories and butter factories for the following purposes:—

1. Detection of Watered Milk.

The legal minimum for total solids is 12 per cent. and for solids not fat is 8·5 per cent. This latter figure is lower than the average which is about 8·8 per cent. The formula given below is based on the average figure of 8·8 per cent., and therefore assumes, quite incorrectly, that all milks containing less than 8·8 per cent. of S.N.F. are adulterated with water. It should be clearly understood that milks which contain less than 8·8 per cent. of solids not fat are not necessarily adulterated, but they may be regarded with suspicion, particularly if the milk is from a herd of Jersey or Guernsey cattle, and to a lesser extent, A.I.S. or Ayrshires. If the S.N.F. are below 8·5 per cent. the milk is of illegal composition in any case and should quite correctly be rejected.

$$\text{Added water} = (8{\cdot}8 - \text{S.N.F.}) \times \frac{100}{8{\cdot}8}$$

Examples:—

(*a*) Fat = 4·2 per cent. Total solids = 13·2 per cent. S.N.F. = 9·0 per cent.

The S.N.F. being above 8·8, the milk is not considered to be adulterated with water.

(*b*) Fat = 3·5%. Total solids 12·0 %. S.N.F. = 8·5%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}5) \times \frac{100}{8{\cdot}8} = 3{\cdot}4\%.$$

This milk may be genuine, but it is equally possible for it to be adulterated with about 3 per cent. of water.

(*c*) Fat = 3·8 %. Total solids = 12·0%. S.N.F = 8·2%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}2) \times \frac{100}{8{\cdot}8} = 6{\cdot}8\ \%.$$

In this case it is more than probable that the milk is from a herd yielding milk with a high percentage of fat, and the supplier has added about 7 per cent. of water, but this was not sufficient to reduce the fat or total solids below the legal minima. The added water has, however, reduced the S.N.F. to below the legal minimum. Such milk should be rejected.

2. Detection of Skimming.

Under this heading is included the addition of skimmed or separated milk, as well as the partial removal of fat. Milk fat has a specific gravity of about 0·93 at ordinary temperatures, and the solids not fat have a specific gravity of approximately 1·62. A mixture of the two, therefore, has a specific gravity between these two limits. The removal of fat increases the proportion of the heavier solids not fat, and thereby raises the specific gravity of the total solids. The addition of separated milk has exactly the same effect. The addition of water does not affect the S.G. of the milk solids as the relative proportions of the fat and the solids not fat remain unchanged. When determined by means of the formula given below, the specific gravity of the milk solids of genuine milks containing 3·3 per cent. or more fat usually ranges from 1·30 to 1·33, sometimes a little lower, but never higher than 1·35. If the specific gravity of the milk solids is from 1·34 to 1·35 skimming may be strongly suspected, while if higher than 1·35, skimming or the addition of skimmed milk has undoubtedly taken place. Such milk cannot therefore be regarded as whole milk, but should be regarded as skimmed milk and treated accordingly.

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - (100\ \text{Sp. Gr.} - 100)}$$

Note:—(100 Sp. Gr. — 100) equals $\frac{1}{10}$ of the corrected lactometer reading, and the formula may be more simply stated as—

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - \frac{1}{10}\ \text{of Lactometer reading.}}$$

Examples—(*a*) A normal milk.

Lactometer reading at 60° F. = 32·0. Fat = 4·0%.

Specific gravity of milk = 1·032

Total solids by previous formula = 12·9%. S.N.F. = 8·9%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}032 \times 12{\cdot}9}{1{\cdot}032 \times 12{\cdot}9 - \frac{1}{10} \times 32{\cdot}0}$$

$$= \frac{13{\cdot}31}{13{\cdot}31 - 3{\cdot}20} = \frac{13{\cdot}31}{10{\cdot}11}$$

$$= 1{\cdot}316$$

(*b*) A partly skimmed milk.

Lactometer reading at 60° F. = 34·0. Fat = 3·3%.
Specific Gravity of milk = 1·034
Total solids = 12·6%. S.N.F. = 9·3%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}034 \times 12{\cdot}6}{1{\cdot}034 \times 12{\cdot}6 - \frac{1}{10} \times 34{\cdot}0}$$
$$= \frac{13{\cdot}03}{13{\cdot}03 - 3{\cdot}40} = \frac{13{\cdot}03}{9{\cdot}63}$$
$$= 1{\cdot}353.$$

(*c*) A partly skimmed and watered milk.

Lactometer reading at 60° F. = 31·0. Fat = 3·0%.
Specific gravity of milk = 1·031
Total solids = 11·5%. S.N.F. = 8·5%.
Added water by previous formula = 3·4%.
(Actually this is a very conservative estimate of the added water).

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}031 \times 11{\cdot}5}{1{\cdot}031 \times 11{\cdot}5 - \frac{1}{10} \times 31{\cdot}0}$$
$$= \frac{11{\cdot}86}{11{\cdot}86 - 3{\cdot}10} = \frac{11{\cdot}86}{8{\cdot}76}$$
$$= 1{\cdot}353$$

The skimming is shown by the high specific gravity of the solids, and the watering by the low S.N.F. This milk, of course, is also deficient in total solids and fat while the solids not fat are the bare legal minimum.

(*d*) A sample of separated milk.

Lactometer reading at 60° F. = 36·0. Fat = 0·10%.
Specific gravity of milk = 1·0360
Total solids = 9·26%. S.N.F. = 9·16%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}036 \times 9{\cdot}26}{1{\cdot}036 \times 9{\cdot}26 - \frac{1}{10} \times 36{\cdot}0}$$
$$= \frac{9{\cdot}59}{5{\cdot}99}$$
$$= 1{\cdot}60.$$

3. Determination of Fat Losses in Buttermilk.

A news item entitled "What is a Fair Over-run?" which was distributed to the Press by this Department in April, 1938, contained this statement—"The percentage of the total fat lost is approximately 1 per cent. in the buttermilk. . . . " This has been questioned by more than one factory manager as being an excessively high loss, but actually it is very conservative. It was calculated from the 1934-5 results of about 800 analyses of buttermilks from 37 Queensland factories. It was used along with other conservative losses as a means of demonstrating that the maximum over-run obtainable when all weights and tests are accurate is in the vicinity of 2 per cent. Since these buttermilks were analysed there have been a large number of modern pasteurisers installed which have undoubtedly raised the fat losses above the 1934-5 figures. McDowall (2) quotes fat losses ranging from 0·96 to 1·73 per cent. for a number of New Zealand factories. The quoted loss of 1 per cent. is, therefore, seen to be as low as can be expected with careful factory methods and this loss should be regarded as unavoidable. Carelessness or rush methods, particularly high churning temperatures, and the churning of freshly pasteurised cream, can greatly increase the fat losses.

Methods of determining the fat losses in buttermilk involve the determination of total solids by the methods given previously. The preliminary stages are:—

(1) Collect a sample of buttermilk preferably as it is run from the churn. The sample may, with considerable advantage, be a composite sample from every churning of butter made during the day.

(2) Determine the percentage of fat by the normal butyl alcohol method.

(3) Determine the lactometer reading and temperature.

(4) Make the necessary correction for temperature, and determine the percentage of total solids by the methods already given, then determine the solids not fat.

(5) Determine the percentage of fat in the unwatered buttermilk by means of the formula:—

$$\text{Fat in unwatered buttermilk} = \frac{\text{Fat} \times 8{\cdot}8}{\text{S.N.F.}}$$

Example:—

Fat in composite sample of buttermilk = 0·62%
Lactometer reading at 56° F. = 22·0°
Lactometer reading corrected to 60°F. = 22·0 − 0·3
= 21·7.
Total solids = ¼ of 21·7 + 1⅛ times 0·62 + 0·14 = 6·31%
Solids not fat = 6·31 − 0·62 = 5·7% (to nearest 0·1%)

$$\text{Fat in unwatered buttermilk} = \frac{0{\cdot}62 \times 8{\cdot}8}{5{\cdot}7} = 0{\cdot}96\%.$$

(As an item of interest the percentage of added water may also be determined by the method given previously, and in the above example will be found to be 35 per cent. This water is added in various ways, such as can steamings, water used to standardise the cream to the desired fat percentage, water used to dissolve the neutraliser, rinsings of neutralising and holding vats, steam condensed during pasteurisation with live steam, break water, &c.)

Unwatered buttermilk is really the non-fatty portion of cream as it is received at the factory. The total quantity of cream received is obtainable from the factory books, and, provided the average percentage of fat in this cream is known, the total quantity of unwatered buttermilk received can be found.

Now some of this buttermilk is retained in the butter but the bulk of it is lost. The true fat losses depend upon the proportion of buttermilk which is lost and to determine this it is necessary to know how much is retained in the butter. From many hundreds of analyses of butter, it has been estimated that butter contains 10 per cent. of buttermilk and this figure has been generally accepted as the average for Australian and New Zealand butters. This being so it is an easy matter to determine the true fat losses. The method is as shown in the following example:—

1,000 lb. of cream of 40 per cent. fat contains 400 lb. of fat and 600 lb. of buttermilk. The 400 lb. of fat will make approximately 490 lb. of commercial butter of which 49 lb. is buttermilk. The buttermilk lost is therefore 600 — 49 = 551 lb. The buttermilk contained 0·96 per cent. of fat, therefore the fat lost is

$$\frac{0{\cdot}96 \times 551}{100} = 5{\cdot}28 \text{ lb., i.e., } 5{\cdot}28 \text{ lb. of the original 400 lb. of fat.}$$

This amounts to 1·32 per cent. of the fat received in the cream. In the same way the fat losses for any weight of cream containing any percentage of fat can be calculated. Fortunately it is not necessary to follow the whole procedure outlined above as the ratios of buttermilk lost to fat received have been calculated for creams of varying fat content and it is only necessary to multiply the percentage of fat in the undiluted buttermilk by the appropriate ratio. In the above example the ratio is $\frac{551}{400} = 1{\cdot}38$.

The ratios, originally tabulated by a New Zealand worker, Udy, in 1929 for cream of 35 to 45 per cent. of fat have been extended to cover the range 30 to 50 per cent. and these ratios are given in Table III.

TABLE III.

RATIO OF BUTTERMILK LOST TO FAT RECEIVED (AFTER UDY).

Fat Test of Cream.	Ratio.	Fat Test of Cream.	Ratio.
30	2·21	41	1·32
31	2·10	42	1·26
32	2·00	43	1·20
33	1·91	44	1·15
34	1·82	45	1·10
35	1·73	46	1·05
36	1·65	47	1·00
37	1·58	48	0·96
38	1·51	49	0·92
39	1·44	50	0·88
40	1·38		

Example—*continued.*

Fat in unwatered buttermilk = 0·96 per cent.
Average fat test of cream received = 40 per cent.
Udy's ratio for cream of 40 per cent. fat = 1·38 per cent.
Fat lost in the buttermilk = 0·96 x 1·38 = 1·32 per cent.

It is hoped that the methods outlined will enable managers of milk depots and cheese factories to check illegal practices by unscrupulous suppliers. Managers of butter factories should be able to determine the extent of their fat losses in buttermilk and a realisation of their extent should be sufficient to make them realise that other losses require to be kept as low as possible. Possible sources of loss which can be checked are spillage during handling of the cans, waste from the cream samples, leakages, splashing from the coolers, loss of froth, extra butter given away in each box during packing, and most prolific source of loss of all, the extra fat given away by low percentages of water and/or salt in the butter.

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1. BURGESS, L. A. This journal, 1936. 56, 633-645.
2. MCDOWELL, F. H. N.Z. Jour. Sc. and Tech., 1938. 19, 682.

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Field Day at Maleny.

TYPICAL of such gatherings, the field day on 18th December on Mr. W. A. Collard's well-equipped dairy farm near Maleny was a notable success. The demonstration was arranged by the district branch of the Queensland Dairymen's Organization, in association with the directorate and management of the Maleny Butter Factory and in co-operation with the Department of Agriculture and Stock. Taking the form of a basket picnic, farmers and their families joined in making it a pleasant social as well as a serious business event. There is no more beautiful and, from a dairying point of view, productive district in Queensland than Maleny, a district obviously imbued with the spirit of progress.

Plate 20.

Farmers' Gathering at a Field Day at Maleny, Blackall Range.

Lectures and practical demonstrations were the order of the day. Milking machines and a separator were taken to pieces, so to speak, by Mr. E. Sutherland, Dairy Machinery Adviser, who explained the function of each part and the necessity for its care and effective operation. Dr. Montgomery White, Agricultural Chemist, spoke of the satisfaction derivable from well-reared calves in successful dairying. Adequate pre- and post-natal feeding, he stressed, had an important bearing of future milk production. The veterinary officer present, Mr. A. K. Sutherland, lectured lucidly on the rearing of dairy calves and the treatment of common ailments in young stock.

Mr. P. Daley, Chairman of Directors of the Maleny Co-operative Dairy Association, assisted by the Manager, Mr. J. Ferguson, directed the proceedings. In an interesting address, Mr. Daley summed up the lessons of the day, and, supported by Mr. A. J. Bryce, conveyed a vote of thanks to the visiting advisers, and the appreciation of all present to Mr. and Mrs. Collard for their hospitality and for the use of their fine property.

The value of such farm field days cannot be over-estimated as an effective means of keeping farmers informed of the best methods of installing and operating farm machinery and of the latest developments in the science and practice of agriculture and animal husbandry.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the Herd Books of the A.I.S., Jersey, Ayrshire, and Guernsey Societies, production records for which have been compiled during the month of September, 1946 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (Standard, 350 Lb.).				
Alfa Vale Florrie 4th	W. H. Thompson, Nanango	16,773·40	672·164	Penrhos Pansy's Pride
Alfa Vale Model 19th	W. H. Thompson, Nanango	14,386·05	586·617	Penrhos Pansy's Pride
Mountain Camp Thelma 24th	J. B. Skerman, Kaimkillenbun	9,843·49	415·387	Trevor Hill Reflection
Rhodesview Queenie 27th	W. Gierke and Sons, Helidon	8,844·15	414·777	Fairvale Major
Rosenthal Handsome 33rd	D. Robinson, Womina, Warwick	8,124·0	396·695	Rosenthal Perfection
Rocklea Beauty	A. J. Larson, North Bundaberg (196 days)	9,025·0	363·214	Salforn View Baldwin
Jamberoo Mayflower 8th	W. Hinricksen, Clifton	7,244·89	356·854	Greyleigh Valiant
Senior, 2 Years (Standard 250 Lb.).				
Glen Idol Primrose 9th	Estate P. Doherty, Gympie	7,533·7	289·668	Blacklands Banker
Bileena Bonnie 10th	W. F. Hemmings, Murray's Bridge	7,818·2	284·059	Tara Governor
Rhodesview Kitty 25th	W. Gierke and Sons, Helidon	7,005·0	279·464	Fairvale Major
Bileena Choice 3rd	W. F. Hemmings, Murray's Bridge	6,440·15	258·086	Tara Governor
Junior, 2 Years (Standard 230 Lb.).				
Glen Idol Florrie 11th	Estate P. Doherty, Gympie	7,601·9	302·364	Blacklands Count
Bunya View Rosette 2nd	J. B. Edwards, Kingaroy	7,102·3	297·727	Bingleigh Royal
Bunya View Susie 2nd	J. B. Edwards, Kingaroy	7,062·05	259·376	Bingleigh Royal
Navillus Shannon 11th	C. O'Sullivan, Ascot, Greenmount	6,096·85	253·058	Greyleigh Eros
AYRSHIRE.				
Senior, 3 Years (Standard 290 Lb.).				
Leafmore Lynne Carver	J. P. Ruhle, Motley	8,737·75	295·863	Myola Bessemer
GUERNSEY.				
Junior, 3 Years (Standard 270 Lb.).				
Laureldale Rouge	W. A. K. Cooke, Maleny	5,399·0	317·853	Laureldale Moonboy

JERSEY.

MATURE COW (STANDARD 350 LB.).

Westwood Lilac	F. Porter, Maleny	8,038·95	447·212	Westwood Noble Monarch
Brookland's Primrose	W. S. Conochie, Sherwood	7,556·9	410·913	Brooklands Padishah
Westbrook Sylvia 10th	Farm Home for Boys, Westbrook	7,140·8	384·773	Oxford Aster's Lad
Sunny Glen Mayflower	J. S. McCarthy, Greenmount	7,038·5	362·401	Ivy Bank Marquis
Ashview Hazeleen	C. Huey, Sabine	7,255·0	360·484	Martinvale Duke

SENIOR, 4 YEARS (STANDARD 330 LB.).

Elwyn Jessie	E. J. Dunning, Stanmore	7,860·25	450·764	Glenside Lone Star

JUNIOR, 4 YEARS (STANDARD 310 LB.).

Windsor Lady Deanna	Johnson Bros., Gleneagle	9,417·75	415·643	Brookland Sultan Victory
Westbrook Wyandotte 2nd	Farm Home for Boys, Westbrook	6,746·65	365·353	Orphanage Comet

SENIOR, 3 YEARS (STANDARD 290 LB.).

Windsor Princess Madge	Johnson Bros., Gleneagle	8,410·95	453·341	Bobs of Wingate
Wyreene Crystobell	H. T. W. Barker, Oakey	5,813·15	325·776	Wyreene Marcella's Boy

SENIOR, 2 YEARS (STANDARD 250 LB.).

Westbrook Pearl 3rd	H. T. W. Barker, Oakey	5,455·6	333·118	Selsey Royal Standard
Westbrook Starbright 4th	Farm Home for Boys, Westbrook	5,651·25	284·224	Selsey Royal Standard

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Strathdean Fern 2nd	S. H. Caldwell, Bell	6,433·84	400·561	Navua Ladora's Ruler
Strathdean Blossom	S. H. Caldwell, Bell	4,827·24	337·007	Strathdean Observer
Strathdean Model	S. H. Caldwell, Bell	5,282·71	326·287	Oxford King's Victor
Tralee Peerless	W. Muller, Marburg	4,811·95	294·756	Oxford Rivoli
Trecarne Some Tottie	H. T. W. Barker, Oakey	6,044·15	294·145	Trecarne Peer 2nd
Lermond Rosie	J. Schull and Sons, Oakey	5,415·35	282·974	Trinity Noble Effort
Romsey Spotlight	J. Wilton, Killarney	5,799·4	282·383	Oxford Pixie's Victor
Trecarne Satety 5th	H. T. W. Barker, Oakey	5,139·15	281·912	Trecarne Some Duke
Brooklands Angel Cake	W. S. Conochie, Sherwood	5,020·65	268·263	Bulby Maria's Keepsake
Tralee Rosette	W. Muller, Marburg	4,833·00	261·717	Romsey Prince Victor
Trinity Glamour Girl	C. A. Edwards, Alderley	5,506·5	257·586	Trinity Crowning Effort

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Windsor Princess Irene	Johnson Bros., Gleneagle	7,667·25	416·812	Wingate Bobs

ANIMAL HEALTH

Sodium Fluoride—A New Treatment for Large Roundworms in Pigs.

F. H. S. ROBERTS, Animal Health Station, Yeerongpilly.

SODIUM fluoride is a well-known insecticide, commonly used to control cockroaches and the lice and mites which attack poultry.

Recent work with this chemical in the United States showed that, when administered in the food, it gave very promising results against worms infesting pigs. These results have been confirmed by investigations carried out at the Animal Health Station, Yeerongpilly. At the dose rates recommended here, it has proved more effective against the large roundworm than either oil of chenopodium or phenothiazine. Encouraging results have been secured also against stomach worm, but further work is required before any recommendations can be made regarding its use against this parasite.

Sodium fluoride is cheap; and treatment is simple, as it is given in the food. It may be used either on single pigs or on groups of pigs, and, unlike most of the anthelmintics when employed for group or mass treatment, it loses little of its efficiency when applied in this manner.

Doses.

Commercial sodium fluoride containing 70 to 80 per cent. of pure sodium fluoride is used. The doses are as follows:—

Live Weight of Pig.	Dose of Sodium Fluoride.	No. of Pigs to 1 oz. Sodium Fluoride.
lb.	grams.	
20	2	14
21-40	4	7
41-60	7	4
61-80	9	3
81-100	12	$2\frac{1}{3}$
101-150	15	2
151-200	20	$1\frac{1}{2}$
Over 200 ..	25	$\frac{5}{6}$

Method of Administration.

Pigs may be treated singly or in groups. The method of administration is the same in either case, and is carried out according to the following directions:—

1. Preparation of Pigs.

(*a*) *Weighing.*—The animals are weighed and, if group treatment is preferred, divided according to the weight ranges in the dosage table.

It makes little difference whether two or twenty pigs are treated at the same time, the size of the group being limited only by the trough space, which should be sufficient to avoid overcrowding.

(*b*) *Starvation.*—No food is given on the evening prior to treatment, the animals being treated next morning. Water is permitted freely.

2. Treatment.

(*a*) *Dose of Sodium Fluoride.*—This is computed according to the dosage table and must be weighed accurately.

(*b*) *Preparation of Treated Food.*—Palatable mashes or well ground grains are the only suitable feeds in which to administer the drug. Milk, garbage and whole grain make mixing very difficult and should not be used. The food should have a high calcium content, as this assists in preventing toxic effects. Sufficient food to last the animals for one day must be put out and the computed dose of sodium fluoride thoroughly mixed with it. This step is highly important, for the sodium fluoride must be ingested gradually, otherwise harmful effects may occur and treatment may not be effective.

An amount of food at the rate of 1 lb. of dry feed for every 25 lb. live weight of pig will be found to be adequate. Thus, a group of 10 pigs, 41 to 60 lb. in weight with a total live weight of 500 lb., will require 70 grams or 2½ oz. of sodium fluoride mixed with 20 lb. of dry mash.

With large pigs, such as breeding sows, it is best to divide the medicated food into two equal portions and feed one portion in the morning and the other in the evening.

The treated food may be fed dry or moist. This should be left before the pigs until consumed, and if necessary, a little fresh untreated mash may be added at evening to "sweeten" it.

The treated food is not unpalatable but there may be some difficulty in persuading pigs accustomed to garbage to take a mash. This can readily be overcome by giving no other food until the treated food is eaten, though this may take up to 2 days.

Effect on Worms.

The worms are removed slowly. They may not commence to pass through until the third or fourth day and the action of the drug may not be completed until the eighth or ninth day. The doses recommended here will remove all the large roundworms from most pigs and the majority from the remainder. The drug will remove both mature ond immature worms and is effective against both heavy and light infestations.

Toxicity.

Sodium fluoride, in the doses recommended here, is very safe—safer, probably, than oil of chenopodium or phenothiazine. In a few pigs there may be a little vomiting followed by diarrhoea. These ill effects are very mild and only temporary. Rarely, it may result in acute fluorine poisoning, the symptoms of which are acute trembling with spasms of the limbs and body. Only one case of acute fluorine poisoning occurred in over 300 pigs treated during the investigations at Yeerongpilly.

There is some danger to pigs which are treated several times during their life time, as the fluorine may be deposited in the bones and teeth, causing the bones to become thickened, spongy and brittle, and the teeth to be pitted and easily broken. Fluorosis, as this disease is called, is least likely to occur when the sodium fluoride is fed in a ration high in calcium.

Until further investigations are made, sodium fluoride should not be used more than four or five times in the lifetime of any animal. It is perfectly safe for pigs raised for pork or bacon, when not more than two treatments should be sufficient to keep the worms from being harmful. It should, however, be used cautiously for breeding sows, especially in those cases where treatment is given each time before farrowing.

Warning.

Sodium fluoride, like all anthelmintics, is a poison. Stocks, therefore, should be carefully labelled and locked away when not being used.

Laboratory Examination of Diseased Fowls.

A. K. SUTHERLAND, Animal Health Station, Yeerongpilly.

THE prevention of disease is one of the important factors governing the financial success of poultry farming. Correct diagnosis of the disease affecting a flock is necessary, otherwise the farmer may waste both time and money on curative or preventive measures which are useless.

In the case of many diseases of poultry, laboratory examination of affected birds is necessary to determine the cause of sickness. Poultry farmers are realising this, and the Animal Health Stations at Yeerongpilly and Oonoonba are receiving ever increasing numbers of fowls for examination. This article is a guide to the type of specimen and the information that is required. An unsuitable specimen not only wastes time and labour, but also prevents the owner receiving the full benefit of the examination.

The three main points, viz., the selection of specimens, the despatch of specimens, and information required will be considered in turn.

Selection of Specimens.

This is most important. The essential points are:—(*a*) In most cases live sick birds are better than dead birds.

Soon after the death of a bird or animal, the carcase commences to decompose as a result of invasion of the body tissues by micro-organisms. This process obscures characteristic features of the disease responsible, and renders the body unsuitable for bacteriological examination.

Although live sick birds are preferred, in some diseases death is sudden, and in such cases dead birds have to be sent. These are usually satisfactory if they reach the laboratory within 24 hours of death. Dead birds should be packed in a sound tin or wooden box, and it is desirable, but not essential, that they be wrapped in a cloth soaked in a weak solution of formalin or lysol. This is to keep ants and flies off the carcase. Dead chickens should be packed in a box with dry

wood-wool or sawdust. Live birds are forwarded by rail in a strong crate. Individual organs are seldom satisfactory, and should not be sent if a whole bird is available.

(*b*) The specimen should show symptoms similar to the other cases in the flock.

Quite often specimens are received which are not typical of the main disease affecting the flock. Birds with lowered resistance are liable to contract a number of minor illnesses which, although the harm done may not be very great, obscure the major disease. If in doubt it is advisable to send several birds.

Specimens should be sent as soon as any signs of illness are seen, for, if despatch is delayed, the results and recommendations may be too late to be of any use.

Dispatch of Specimens.

Specimens should be accompanied by the following information:—

(*a*) Sender's name and address.

(*b*) The number of birds forwarded, and the type and age of each bird. When more than one is sent, information identifying each specimen should be included.

(*c*) The crate or package should be properly addressed, and should be despatched by the quickest possible route.

Information Required with Specimens.

This point is very often neglected, and the laboratory worker is left to guess important details which should have been supplied by the farmer. If possible, the Animal Health Station should be advised when to expect the specimens. A covering letter detailing the following points should be sent:—

(*a*) The types of birds in the flock;

(*b*) The number of birds and numbers of different ages;

(*c*) The number of deaths, and at what intervals the deaths have occurred;

(*d*) Percentages of recoveries, if any;

(*e*) Housing conditions;

(*f*) The type and amount of food supplied;

(*g*) The symptoms as seen on the farm. These are important. The following quotation from "Farming in South Africa" gives a good idea of what is required in this respect:—

> "Do not try to interpret symptoms. E.g., instead of saying that the fowl had diarrhoea, say the droppings were very watery and yellowish green, and smelt badly; instead of saying the fowl was blind, say the lids were stuck together over the eye, or that over a period of months the reddish-brown part of the eye had gradually turned grey till the fowl could no longer see out of that eye. A simple, straightforward account of the symptoms does not include a farmer's thoughts and deductions, but only a plain description of what he has ascertained by using only his eyes, nose, ears, and hands."

If the above points are observed, the laboratory can make a satisfactory diagnosis and recommend steps to be taken in the control and prevention of the disease.

GENERAL NOTES

Seasonal Greetings Acknowledged.

Seasonal greetings, all of which are cordially reciprocated, have been received from:—

The Hon. H. H. Collins, M.L.A.; the Hon. T. L. Williams, M.L.A.; the Hon. T. A. Foley, M.L.A. and Mrs. Foley; the Under Secretary and Staff of the Western Australia Department of Agriculture; the Governor and Deputy Governor of the Commonwealth Bank of Australia; the President of the United Graziers' Association of Queensland (Mr. P. B. Newcomen); the Missionaries of the Divine Word, St. Vincent's Missionary Seminary, Marburg, Queensland; Brisbane Legacy; the Chairman and Members of the R.S.L. War Veterans' Home Committee; the Members of the Executive Committee of the Council of Agriculture; the Officers and Members of the Ipswich Workshops Educational Association; the Deputy Director of the Ministry of Post War Reconstruction (Mr. E. F. Router); the Commissioner and Staff of the State Government Insurance Office; Wincheombe Carson, Limited; Myers and Co. Proprietary, Limited; Taubmans Proprietary, Limited; Thermax Water Heaters Proprietary, Limited; *The Monto Herald;* Falkiner Machinery Company, Limited; W. C. Haigh, Ipswich; International Harvester of Australia, Limited; the Co-ordinator-General of Public Works (Mr. J. R. Kemp); the Farmers' Centre, Dalby.

Staff Changes and Appointments.

Mr. N. E. H. Caldwell, M.Agr.Sc., Entomologist, has been appointed Horticulturist, Division I., Horticulture Branch, Department of Agriculture and Stock.

Messrs. J. M. Harvey, M.Sc., and H. L. Wood, M.Sc. (Adelaide), A.A.C.I., Analysts in the Agricultural Chemical Laboratory, have been appointed Chemists, Division II., Chemical Laboratory, Division of Plant Industry, Department of Agriculture and Stock.

Mr. C. M. Goy, Clerk of Petty Sessions, Sarina, who has been seconded for duty as Acting Private Secretary to the Minister for Agriculture and Stock, has been appointed Private Secretary to the Minister.

Mr. H. G. Moon, Dip. Pub. Admin. (Bardwood Park, N.S.W.), has been appointed Marketing Reporter, Marketing Division, Department of Agriculture and Stock.

The Pest Destroyers Board.

The Pest Destroyers Board, constituted under *The Pest Destroyers Act of* 1939, has been reconstituted for a period of two years from 14th December, 1946. In addition to the Agricultural Chemist, Dr. M. White, and the Registrar, Mr. F. B. Coleman, the following have been appointed:—Dr. F. H. S. Roberts (Entomologist, Veterinary), Dr. J. Legg (Pathologist, Veterinary), Messrs. J. H. Smith, (Entomologist, Plants) and J. H. Simmonds (Pathologist, Plants).

The Veterinary Medicines Board.

The Veterinary Medicines Board constituted under *The Veterinary Medicines Acts*, 1933 to 1938, has been reappointed for a period of two years from 14th December, 1946. In addition to the Agricultural Chemist and the Chief Inspector of Stock, Drs. F. H. S. Roberts and J. Legg are the Bacteriologist and Veterinary Surgeon, respectively, on the Board.

Honey Board.

Notice of Intention to extend the operations of the Honey Board for a further period from 9th March, 1947, to 8th March, 1950, is contained in an Order in Council issued under *The Primary Producers' Organiastion and Marketing Acts.*

Fertilizer Rationing.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has announced that the fertilizer supply position in Queensland is at present so satisfactory that it appears that no useful purpose can be served by a continuation of the present system of rationing of fertilizers. Therefore, as from the 1st January, 1947, the sale of fertilizers within the State of Queensland will not be subject to control other than as follows:—While the State supplies are subject to a quota system, or are in limited supply, it will be necessary to continue allocations to the manufacturers, who are charged with the responsibility of apportioning their supplies in such a manner as to ensure that their clients' needs are satisfied. All abnormal orders received are to be referred to the Standards Branch of the Department of Agriculture and Stock for attention.

First priority of delivery must be granted in respect of any permits to purchase fertilizer which may be issued by the Department of Agriculture and Stock. The Minister added, however, that in the event of circumstances warranting it, the Department might again have recourse to rationing of fertilizers either in whole or in part.

In Memoriam.

SYDNEY SMITH HOOPER.

THE death of Mr. S. S. Hooper, formerly Chief Accountant of the Department of Agriculture and Stock, which occurred on Saturday, 23rd November, 1946, is recorded with deep regret.

Plate 21.
Mr. S. S. Hooper.

The late Mr. Hooper entered the Public Service as a clerical assistant in 1886, and became accountant of the Department of Agriculture in 1894. For more than forty years he framed the annual estimates of the Department, and the method evolved by him was adopted subsequently by other Government departments. Every year he attended sittings of Parliament to assist his Minister in the presentation of departmental estimates, and was accorded the unusual distinction of oft-repeated references in the Assembly to the value of his work. He was noted for his successful financial administration. Many juniors whom he trained afterwards achieved high distinction in the accountancy and legal professions.

On the occasion of his retirement in June, 1936, after forty-two years service to the State, high tributes were paid in Parliament by leaders on both sides of the House to his integrity, zeal and capacity as a public officer. A former Premier, Hon. W. Forgan Smith, LL.D., said of him that "he was a capable and loyal officer whose services I appreciated to the full." The Minister for Agriculture and Stock at the time, Hon. Frank W. Bulcock, spoke of Mr. Hooper as a man of great capacity and strong and enduring purpose who had rendered invaluable service to Queensland during his long and distinguished career. He had been more than a staff officer to the fifteen Ministers under whom he had served, and "was that rare type of public officer who was not only a Minister's accountant, but also his guide and friend." He retired from the Public Service with the knowledge that he possessed the confidence of everyone with whom he had been associated, as well as the high esteem and deep and abiding affection of his colleagues.

During the war years, Mr. Hooper patriotically rejoined the Department temporarily to assist in easing the situation caused by the absence of many officers on active service with the Armed Forces. When informed of his death, members of the Legislative Assembly referred sympathetically to the passing of a man who had established high standards in public administration, and who otherwise had served nobly his day and generation.

Rural Topics

More Wool, More Work.

Speaking on "Wool and What It Means to Australia" at the annual conference of the Countrywomen's Association of South Australia in Adelaide, Miss G. MacKinnon, Secretary of the Australian Wool Board, said that a recently published graph showed the direct relationship between the value of the Australian wool clip and the number of persons gainfully employed. It emphasised that as the value of the clip rose, so the prosperity of our working population increased.

Miss MacKinnon said the high prices realised at the recent wool auctions had had the effect of giving buoyancy to the whole economic outlook. It was the first real fillip given to Australia's economy since the war ended.

The reason was, of course, that wool was the most important single industry in this country, representing about 12 per cent. of the total value of all Australian production and 40 per cent. of the gross value of our exports.

To-day wool was one of the bulwarks of Britain and the Empire, just as centuries ago it made for England's economic strength.

In Elizabeth's reign it was decreed, in order to increase the use of wool, that everyone over the age of seven must wear a wool cap when out of doors. And in Charles II.'s reign a law was passed requiring that the dead should be buried in a wool shroud.

A show of hands was called for on the question as to whether those present would wear lightweight wool stockings if they were available; almost everyone of the 250 present signified that they would.

Care in Handling Poultry.

On the farm, in the market, at poultry exhibitions or shows, or during transit, it is inexcusable to handle poultry roughly. Even carrying them by the legs or wings is objectionable, and may cause injury. To catch fowls in the laying house place a wooden framework covered with wire-netting, about 6 ft. high, across one corner of the house. Carefully drive the birds behind this partition where a helper located behind the framework may catch the birds quietly. An opening in the framework, about 3 ft. from the ground and extending to the top, will enable the helper to pass the birds through. A bag nailed at the top and allowed to hang down over the opening will prevent the birds from escaping.

When crating for market, fowls should be given sufficient room in the crate. If overcrowded, the birds may be injured or die in transit. When the distance to market is great, the birds should be fed and given a drink just before they are despatched. For turkeys, straw should be placed in the crate to avoid damage to the breasts, and the different sexes should be placed in separate crates. If a small lot is placed in one crate, the males and females should be separated with a division. Various sizes and kinds of poultry should always be separated.

The practice of dropping crates of poultry heavily on the ground during loading and unloading, or handling poultry roughly as they are being moved in or out of transport crates, is most detrimental to the birds, apart from its cruelty.

How Julia Creek was Named.

A little-known historical fact is the story relating to the naming of Julia Creek. Robert O'Hara Burke, who, with Wills, opened up this part of the country, was a romantically minded Irishman, and named the creek after the beautiful Julia Matthews, musical comedy star of those days. It is said that the ill-fated Wills was an aspirant to the affections of the actress, and because of her unsympathetic attitude towards his advances he went on the expedition with Burke. Incidentally, Julia Matthews later went to New Zealand and the U.S.A. and in both countries was a success. She died in Missouri.—"*The Professional Officer (Q.).*"

The Queensland Year Book, 1945.

The Government Statistician has published the sixth issue of the Queensland Year Book. This is the first issue since 1941, after which publication was suspended because of war conditions.

Some sections have been re-written and amplified to keep the Year Book up to date; included in the more important sections of the new material are:—Maps showing normal summer and winter rainfall. The progress of artesian bores, and a summary of a report by a special committee appointed to investigate the diminution of bore flows. Live stock classified according to type; artificial fertilizers used on crops and pastures; and machinery used on rural holdings. Results from Queensland Family Expenditure Enquiry made in 1939-40. Average requirement of nutrients and consumption in Queensland and other countries. Uniform Taxation and its application to Queensland.

Some interesting items selected from this publication are:—

Population.—The population of Queensland at 31st December, 1944, was 1,071,441. The proportion living in the City of Brisbane was 35.9 per cent. Since 1939 Brisbane's population has increased by 16.4 per cent.

Social Services.—Primary and Secondary Schools at the end of 1944 numbered 1,765 and had a net enrolment of 170,210 during 1944. The 116 public hospitals treated 118,055 general patients and 16,752 maternity patients during 1943-44. The number of maternity allowance claims paid in 1943-44 was 23,743, and at 30th June, 1944, there were 148,021 children in Queensland for whom Child Endowment was being paid.

Production.—The net value of production in 1943-44 was £57 million in primary industry and £30 million in secondary industry.

Manufacturing.—The value of all goods and services produced by Queensland's 2,588 factories in 1943-44 was worth £88 million, including Meatworks £15 million, Butter and Cheese Factories £12 million, Sugar Mills £10 million, and Vehicle and Metal Industries £18 million.

Transport.—There were 125,138 Motor Vehicles registered at 30th June, 1944, of which 67,188 were private cars, and 50,290 trucks. There were 2,516 serious traffic accidents reported in which 230 persons were killed and 3,188 injured.

Trade.—Imports for 1943-44 amounted to £45 million. (Oversea £16 million and Interstate £29 million) and exports were £37½ million. (Oversea £18 million, and Interstate £19½ million.)

Public Finance.—The Queensland Government received £8,783,000 (including £5,821,000 reimbursement of income taxation) from taxation in 1943-44 and received £2,254,000 from land revenue. The net public debt at 30th June, 1944, was £127,334,000.

Private Finance.—Deposits at cheque-paying banks at 30th June, 1944, totalled £117,184,000, and at Savings Banks £80,094,000. Average weekly bank clearings rose from £4¼ million in 1939 to £7 million in 1944. There were 575,000 life assurance policies in force at the end of 1943 with a sum assured of over £97 million.

Rust-Resistant Wheat Saved U.S.A. Millions.

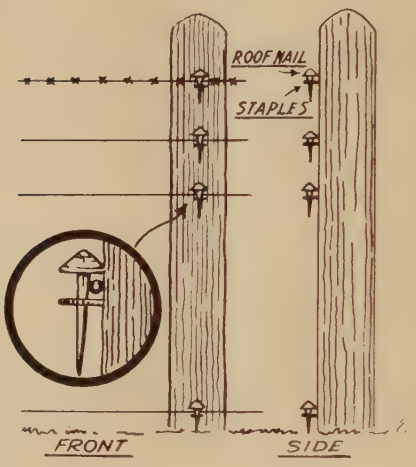
Son of a farmer in the boulder-strewn Coteau Hills of South Dakota, U.S.A., a modest little man known personally to very few, Edgar McFadden, is claimed to have saved United States wheat farmers more than 400,000,000 dollars during the war years by producing a rust-resistant wheat.

In the dread rust year of 1904 when Edgar was just a 13-year-old lad, he noticed that a stock feed wheat grown on his father's farm, was not bothered by rust. This was Yaroslav emmer. Later, in college, Edgar asked laboratory scientists whether the worthless emmer, crossed with Marquis, might not produce a rust-resistant type. The answer was no. But the lad persevered, even though Marquis flowered early and emmer late. On the one overlapping day, 4th July, 1917, the lad toiled over his wheat mating, but the results of his labour produced only one green sprout. This single seed produced 100 shrivelled kernels, which, though rust resistant, were subject to stem rot. For six years McFadden stuck to his self-appointed task, mortgaging his farm, raising money on his insurance policy, and eventually producing Hope, resistant to stem rot, leaf rust, and five other diseases. Thus spurred by success, he went on to produce Rival, Pilot, Mida, Austin, and Cadet since the war started. More than 1,000,000 acres of Austin were planted in Texas on land which had never previously been able to produce wheat.

For all the millions of dollars that he has put into the pockets of U.S.A. farmers, Edgar McFadden has profited not a penny. He lives modestly in Texas to-day, still fighting man's bloodless battle for bread.—*The Land* (Sydney).

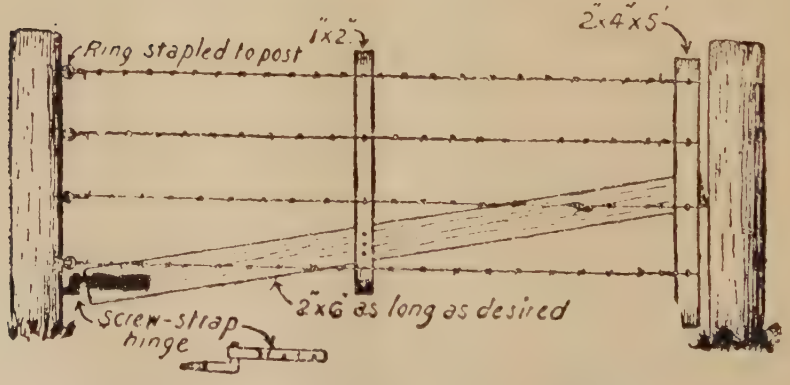
GADGETS AND WRINKLES

"LIGHTNING" FENCE.



Here is a useful idea for a temporary fence. Staples can be driven into stakes or posts, the wire (or netting) is pressed against the uprights and a roofing nail dropped through the staples as illustrated.

AN IMPROVED WIRE GATE.



An improvement on the ordinary "concertina" type of wire gate.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE CHILD WHO IS UNDERWEIGHT.

THE loving eye of father or mother often overlooks the absence of some or many of the points that go to make for good health and is satisfied if the child has only a few good health marks to his credit. For this reason, the parents who have their children's welfare at heart will wisely take them to their family doctor or, if they live in the metropolitan area, to one of the Toddlers Health Centres for regular weighing and health examination.

A growing child needs the correct body weight to match his height; he needs some fat stored under the skin. This improves his appearance and helps to keep him warm. It is surprising how a thin girl or boy improves in looks when a few extra pounds are added to the weight. The average gain of a school child is about half a pound a month. The underweight child should gain more than the normal child in order to reach the average weight for his age and height.

Something is wrong with a child who does not gain or who shows a steady loss of weight in spite of what may seem to be proper care and a thorough medical examination is called for in this case. Children who, though not ill, are much below weight for their height usually fall into two main types:—

(1) The over-energetic type, keyed up, excitable, too active and often difficult to manage. These children often have good muscular development, but practically no fat under the skin.

(2) The mentally dull, listless type, lacking in energy and ambition, easily fatigued and with poorly-developed muscles and flabby tissues.

School surveys have shown that underweight is not confined to the children of poorer parents. A surprisingly large number of children in well-to-do families also are undernourished.

No underweight child should be admitted even to a Kindergarten School until every effort has been made to bring him up to normal weight. When the underweight child is not given care during the pre-school period, the demands of school life make it harder for him to regain his weight, and he may remain stunted throughout his life.

Health Rules for the Underweight Child.

After the doctor has advised regarding any physical defects, arrange that the following routine is followed as closely as possible:—

1. Three meals a day—eaten slowly. These should be taken from the important articles of food; milk, whole grain cereals and bread, meat, fish, eggs, vegetables, and fruit. A drink of milk and a piece of fruit may be given between meals. No sweets.

2. The bowels should be kept open.

3. Rest periods in a quiet room with the windows open one hour in the morning and half an hour in the afternoon. Ten to twelve hours sleep at night according to age.

4. No hard exercise until the weight is normal, but plenty of playtime out of doors.

5. No nervous excitement—very few parties or movies or picnics until the weight is normal. Motor trips should be avoided. Learning a handicraft may be helpful to the nervous, highly-strung child.

6. If the child has already started school, outside extra classes and homework should be omitted or very much reduced. The doctor may advise complete absence from school for a time.

Any further advice re this or any other matter can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters, *Baby Clinic, Brisbane*; these letters need not be stamped.

IN THE FARM KITCHEN.

Bran and Raisin Bread.

Take 1¼ cups each bran, wholemeal, and white flour, ½ cup of honey, chopped raisins, and crushed nuts, 2 teaspoons baking powder, 1 teaspoon salt, 1 egg, 2 tablespoons sugar, 1½ cups milk. Mix dry ingredients together, add raisins and nuts, moisten with milk, beaten egg, and honey. Beat well and bake one hour in a moderate oven.

Wholemeal Bread.

Three cups wholemeal, 2½ teaspoons baking powder, ½ teaspoon baking soda, ¾ teaspoon salt, 1 tablespoon golden syrup, 2 teaspoons raw sugar, 1 cup milk. Mix the dry ingredients together and stir in the golden syrup and milk. Add a little more milk if the mixture seems too stiff. Bake in a large tin for one hour. This mixture is sufficient to fill three baking powder tins, which require only 35 minutes baking time.

Buttermilk Raisin Bread.

Four cups flour (wholemeal or half wholemeal and half white), ¼ cup sugar, 1 teaspoon salt, 1 teaspoon bicarbonate soda, 1 teaspoon baking powder, 2 cups freshly-churned buttermilk, ½ cup chopped nuts, 1 cup raisins. Sift the flour once, add sugar, salt, soda, and baking powder and sift again. Add buttermilk and beat well. Lastly, add nuts and raisins and bake about three-quarters of an hour in loaf tin.

Peanut Butter Bread.

Two cups enriched flour, 1-3 cup sugar, 2 teaspoons baking powder, 1 teaspoon salt, ¾ cup peanut butter, 1 egg well beaten, 1 cup milk (scant). Sift together flour, sugar, baking powder and salt. Work into this, with fork, peanut butter and egg. Add milk. Put into buttered pan and bake 50 to 60 minutes in moderate oven (350 deg. F.). This makes one loaf.

QUEENSLAND WEATHER IN DECEMBER.

Rainfall distribution was again below normal in most divisions. Following on the relatively poor distribution of seasonal local inland thunderstorms during October and November, the rainfall in December was very little better and mostly patchy and variable. The only divisions showing over-average aggregate rains were the Peninsula South 733 points (average 605), the Upper Western 191 points (average 184), and the Maranoa 283 points (average 258). Parts of the Upper West about the Plateau were relatively fortunate for western areas in receiving rain on three occasions, 6th, 20th, 25th-27th, the last period being associated with an inflow of moist, tropical air which improved the figures for the Peninsula, Carpentaria, and some districts to the west of Townsville. The above-average figures for the Southern Peninsula were also chiefly a result of this tropical inflow. The Maranoa Division received chiefly light to moderate falls in the first week and from 11th to 16th; the district totals were mainly increased by local falls of two to two and a half inches in the Yuleba-Surat areas on the 19th. Below-average totals, yet better than most other divisions, were recorded in the Upper Carpentaria, Central Highlands, and Darling Downs Divisions. Several divisions—Peninsula North, Lower Carpentaria, South Coast, and Warrego—showed district aggregates of approximately 35 to 40 per cent. below normal. All other divisions of the State were over 50 per cent. down on average rainfall aggregates for the month, the lowest being Central Lowlands (— 68 per cent), North Coast Herbert and Central Coast East (— 66 per cent.). An examination of individual station recordings shows that in addition to the districts abovementioned with December aggregates above average, there were also some scattered over-average totals in Southern Carpentaria, Central Highlands, Downs, and South Coast, but it is evident that a good seasonal rain distribution is needed over most of the State to offset the many consistent deficiencies since April, 1946.

Pressure.—During the month there was no marked development of systems needed for the production of general rain. Monsoonal influences became evident in the far North from 26th onwards and a tropical depression developed off the North Coast on 30th, ultimately deepening to a cyclonic centre moving south-eastwards from Willis Island on the 1st January, 1947. The development of this cyclone was not at the time assisted by south-easterly flow from a southern "high" and its rain influence in December deteriorated accordingly. Indicative of the persistence of the high pressure ridge over the Queensland east coast, the only period when south-easterlies rached the Gulf Country was 7th to 10th. A dip formation, Carpentaria to South-east Queensland, which developed into a shallow "low" moving across North-east New South Wales to seaward by the 4th, gave fairly general thunderstorm rains in Central Highlands, Downs, and South Coast.

High Winds.—A violent thunderstorm occurred at Brisbane on the late afternoon of the 3rd, with hail damage and a maximum gust from the S.S.E. of 79 miles per hour which was the highest on record for the city. Another severe storm recorded S.W. 89 miles per hour at Archerfield on the 15th (and 65 m.p.h. at the bureau). There were local severe blows in the northern Downs and Central Highlands on the 12th, particularly in the Ilfracombe district, rail and bridge damage resulting.

Temperatures.—Average maximum and minimum temperature readings over the State were mostly higher than normal. The highest daily maximum reading of 111 deg. was recorded at Boulia on the 13th. Temperatures of over 100 deg. were reported on 23 days at Winton, 20 days at Windorah and 18 days at Boulia and Longreach. Winton had 11 consecutive recordings over the century from 10th to 20th, and 14 out of the high temperatures there topped 105 deg. with a maximum of 109 deg. on the 18th.

Brisbane.—Mean pressure $\frac{9+3}{2}$ 29.872 inches (normal 29.889). Temperature, mean maximum 85.7 deg. (normal 84.7 deg.); mean minimum, 69.4 deg. (normal 67.4 deg.), highest since 70.7 deg. in 1923 and the third highest on record; mean temperature, 77.5 deg. (normal 76.1 deg.). Highest daily temperature 99 deg. on 30th, lowest daily temperature 62.8 deg. on 4th.

Rainfall.—611 points on 9 days (average 505 points on 12 days). (The severe thunderstorm of the 3rd, record wind gust of 79 m.p.h. from the S.S.E. gave 278 points of this total). Sunshine, 263 hours (normal 253) giving mean daily of 8.5 hours (normal 8.3).

The rainfall position is summarised below:—

Division.	Normal Mean.	Mean Dec. 1946.	Departure from Normal.	Progressive Totals, May to end of December.	
				Normal.	1946.
	Points.	Points.	Per cent.	Points.	Points.
Peninsula North	702	446	36 below	1216	924
Peninsula South	605	733	21 above	1045	759
Lower Carpentaria	392	261	33 below	728	337
Upper Carpentaria	377	327	13 ,,	850	465
North Coast Barron	690	298	57 ,,	1946	795
North Coast Herbert	690	237	66 ,,	2441	679
Central Coast East	454	153	66 ,,	1447	443
Central Coast West	333	137	59 ,,	967	359
Central Highlands	316	228	28 ,,	1270	556
Central Lowlands	221	70	68 ,,	866	216
Upper Western	184	191	4 above	553	279
Lower Western	137	53	61 below	566	88
South Coast Port Curtis	455	277	39 ,,	1826	998
South Coast Moreton	509	320	37 ,,	2388	1129
Darling Downs East	351	320	9 ,,	1669	1147
Darling Downs West	277	197	28 ,,	1309	716
Maranoa	258	283	10 above	1281	548
Warrego	215	131	39 below	988	288
Far South-west	155	75	51 ,,	722	115

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

FEBRUARY.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.21	6.42	Cairns	41	17	Longreach	40	30
6	5.24	6.40	Charleville ..	29	25	Quilpie	34	36
11	5.28	6.36	Cloncurry	57	42	Rockhampton ..	15	5
16	5.32	6.32	Cunnamulla ..	28	30	Roma	18	16
21	5.35	6.28	Dirranbandi ..	18	20	Townsville ..	34	16
26	5.38	6.23	Emerald	24	14	Winton	46	34
28	5.40	6.21	Hughenden ..	42	27	Warwick	3	5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	2.28	12.23
2	3.36	1.13
3	4.43	2.10
4	5.44	3.14
5	6.39	4.22
6	7.26	5.32
7	8.07	6.40
8	8.43	7.45
9	9.17	8.46
10	9.49	9.44
11	10.21	10.41
12	10.55	11.37
		p.m.
13	11.31	12.32
14	..	1.27
	a.m.	
15	12.10	2.21
16	12.54	3.14
17	1.41	4.05
18	2.32	4.52
19	3.27	5.35
20	4.24	6.15
21	5.21	6.51
22	6.18	7.25
23	7.15	7.58
24	8.13	8.31
25	9.11	9.05
26	10.11	9.40
27	11.14	10.20
	p.m.	
28	12.19	11.06

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	12	27	27	42	1	18	29	50
6	13	27	28	42	3	18	32	50
11	25	16	41	31	16	7	47	36
16	29	10	45	24	20	0	52	27
21	25	14	42	29	17	4	49	33
26	15	24	30	40	6	16	35	47
28	12	28	27	43	2	19	30	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	9	47	37	62	21	47	8	39
3	5	52	35	65	19	50	5	44
5	9	51	37	64	21	50	8	43
7	19	42	42	59	27	44	17	36
9	29	31	50	52	35	37	25	27
11	39	22	56	45	41	30	33	19
13	47	12	63	38	47	24	39	12
15	51	6	65	34	49	20	42	7
17	54	4	67	33	51	19	44	5
19	52	8	66	36	50	21	43	18
21	44	16	61	41	45	26	37	5
23	35	25	54	47	39	32	29	22
25	25	36	47	55	32	40	21	31
28	10	49	37	63	22	49	9	41

Phases of the Moon.—Full moon, 6th February, 1.50 a.m.; Last Quarter, 13th February, 7.58 a.m.; New Moon, 21st February, 12 noon; First Quarter, 28th February, 7.12 p.m.

On 15th February the Sun will rise and set 15 degrees south of true east and true west respectively and on 9th and 24th February the Moon will rise and set at approximately true east and true west.

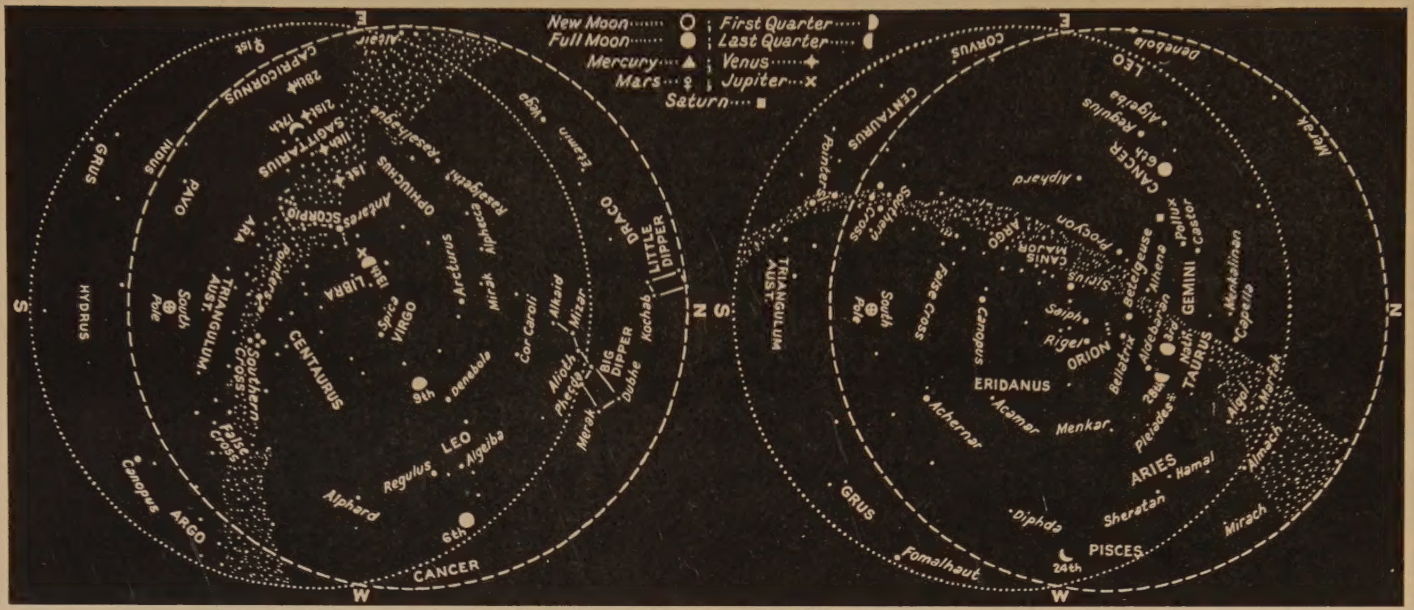
Mercury.—In the constellation of Caprisornus, will set about 30 minutes after the Sun at the beginning of February and on the 21st will reach its greatest angle east of the Sun, when it will set about 45 minutes after sunset. At the end of the month, in the constellation of Pisces, it will sink below the western horizon about 30 minutes after the Sun.

Venus.—At the beginning of the month, in the constellation of Sagittarius, will rise between 1.55 a.m. and 3 a.m. It will continue as a morning object throughout this month and on the 28th will rise between 2.15 a.m. and 3.15 a.m.

Mars.—Still too close in line with the Sun for observation.

Jupiter.—In the constellation of Libra, will rise about midnight at the beginning of the month and between 10 p.m. and 11.15 p.m. at the end of the month.

Saturn.—Is now an evening planet in the constellation of Cancer and will rise about sunset at the beginning of February and about two hours before sunset by the end of the month.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th February. (For every degree of Longitude we go west time increases four minutes.) The chart on the left is for eight hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing North, hold "N" at the bottom; when facing South, hold "S" at the bottom; and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about four minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th, and at the end of the month about one hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

DECEMBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of years' records.	Dec., 1945.	Dec., 1946.		Dec.	No. of years' records.	Dec., 1945.	Dec., 1946.
North Coast.	In.		In.	In.	*South Coast—cont'd.*	In.		In.	In.
Atherton	7·02	42	5·98	2·02	Gatton College ..	3·89	44	5·20	..
Cairns	8·53	61	12·31	2·25	Gayndah	4·21	72	1·83	4 06
Cardwell	7·95	71	5·35	1·12	Gympie	5·40	73	2·91	2·05
Cooktown	6·53	67	6·88	4·55	Kilkivan	4·61	62	2·36	3·00
Herberton	5·64	57	3·41	2·14	Maryborough ..	5·05	72	3·12	2·21
Ingham	6·77	51	4·15	1·66	Nambour	6·65	47	8·04	3 51
Innisfail	11·16	62	5·90	4·86	Nanango	3·86	61	2·63	2·27
Mossman	8·00	19	10·09	4·88	Rockhampton ..	4·67	72	1·98	2·37
Townsville	5·33	72	1·02	1·16	Woodford	5·34	55	3·62	2·44
Central Coast.					*Darling Downs.*				
Ayr	4·20	56	2·33	1·95	Dalby	3·49	73	3·27	1·82
Bowen	4·49	72	1·42	1·40	Emu Vale	3·52	47	2·29	2·98
Charters Towers ..	3·26	61	2·35	2·08	Jimbour	3·44	64	2·23	2·00
Mackay	6·86	72	1·90	1·08	Miles	3·17	58	2·69	2·33
Proserpine	7·72	40	2·41	1·15	Stanthorpe	3·56	70	3·60	4·00
St. Lawrence ..	4·67	72	0·33	2·11	Toowoomba	4·53	71	5·01	2·21
					Warwick	3·50	78	2·86	4·97
South Coast.					*Maranoa.*				
Biggenden	4·85	44	4·92	2·84	Roma	2·59	69	2·35	1·26
Bundaberg	5·10	60	1·12	1·44	St. George	2·09	62	1·36	2·31
Brisbane Bureau ..	5·05	94	5·32	6·11					
Caboolture	5·48	67	2·91	2·94					
Childers	5·80	48	1·48	4·50	*Central Highlands.*				
Crohamhurst	7·19	50	5·14	3·00	Clermont	3·77	72	1·13	2·67
Esk	4·76	56	7·74	2·80	Springsure	3·28	74	1·53	2·53

CLIMATOLOGICAL DATA FOR DECEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	88	74	91	13, 17, 31	70	1, 2, 3, 8	225	11
Herberton	..	85	63	92	4	57	1, 2	214	9
Townsville	..	88	76	91	10, 17	72	1, 21, 22	116	8
Rockhampton	29·87	92	71	100	18 9	65	26, 27	237	6
Brisbane	29·91	86	69	99	30	63	4	611	9
Darling Downs.									
Dalby	..	93	67	102	30	54	10	182	7
Stanthorpe	..	83	59	93	27, 30	41	10	400	10
Toowoomba	..	86	62	95	30	46	10	221	10
Mid-Interior.									
Georgetown	29·83	98	75	103	1, 6, 7, 10, 17	68	28	380	5
Longreach	29·82	98	75	109	4, 18	63	10	55	6
Mitchell	29·83	94	69	102	30	57	10	259	8
Western.									
Burketown	..	97	77	106	16, 17	71	29	347	5
Boulia	29·76	101	75	111	13	66	11	67	4
Thargomindah	29·81	95	71	108	20	60	8, 9	86	5

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